
# Essays on Financial Integration

**Jessie Nabulambo Kilembe**

Submitted in fulfilment of the requirements for the
Degree of Doctor of Philosophy in Economics

Adam Smith Business School
College of Social Sciences
University of Glasgow

November 2019

# Abstract

Financial integration has progressively increased over the past decade. Following the global financial crisis and the turmoil that ensued, external financing conditions changed. The global financial architecture went through significant adjustments consequently affecting global financing conditions. Emergent issues in response to the evolving global financial conditions included changes to monetary and financial sector regulation which had consequences for the capacity of banks to extend credit. Accordingly, the availability of credit is likely to have adversely affected the investment activity of firms, with potentially a more pronounced effect on for multinational corporations exposed to greater risk and information asymmetry associated with investing in foreign countries.

In advanced economies, central banks pursued expansionary monetary policies to stimulate domestic economies by lowering the short-term policy interest rates. The central banks lowered the policy rate to the effective lower bound and resorted to unconventional tools of monetary policy in efforts to revive domestic economic activity. However, as a result of greater financial integration across countries, the unconventional monetary policies adopted by major economies also generated unintended consequences for countries abroad. International financial institutions which play a critical role in the intermediation and allocation of capital across countries also facilitated this cross-border transmission. Accordingly, the unconventional monetary policies pursued by the United States, United Kingdom, Japan and the European Central Bank instigated debate pertaining to the consequences of the spillover effects. Moreover, the evolving global financing conditions and low interest rate environment that ensued subsequent to the global financial crisis also catalysed the surge in capital flows going to emerging market and developing economies.

Furthermore, a period of slow growth ensued in the aftermath of the global financial crisis. This slow global growth has been largely attributed to greater uncertainty which has been observed to have had a detrimental on real economic activity. Firms are more inclined to postpone large investment activities when uncertainty is high.

Moreover, various types of uncertainty will probably influence firms and households' decisions differently. It is within this context that there has been a rise in prominence of policy debates on the role of different types of uncertainty for economic activity and most recently capital flows. Therefore, the focus of this thesis is the role of external financing conditions and uncertainty on multinational corporations' cross-border direct invest and the consequences of unconventional monetary policies implemented by major advanced economies on the portfolio allocation of institutional investors. The thesis presents three chapters in macroeconomics with an emphasis on cross-border capital flows and the role credit constraints and uncertainty and cross-border asset allocation of institutional investors in response to monetary policies in developed economies.

The first empirical chapter examines the effects of country-specific financial market development on cross-border direct investment. It examines the extent to which financial development in source and host countries affects bilateral foreign direct investment(FDI). Using the gravity model, the effects of financial market development on outward foreign direct investment to emerging market and developing economies is investigated. Furthermore, it examines the role of the global financial crisis and idiosyncratic systemic banking crises on outward bilateral foreign direct investment. The main finding is that greater financial development in both origin and destination countries enhances outward bilateral foreign direct investment. The results confirm the volume of outward foreign direct investment to emerging market and developing economies declined with the global financial crisis. Furthermore, in source countries experiencing a systemic banking crisis, there is evidence that financial constraints reduced aggregate outward foreign direct investment.

The second empirical chapter examines the international transmission of monetary policy through financial institutions. International financial institutions have a critical role in intermediating and allocating capital across countries and therefore facilitating cross-border transmission of monetary policy. Using quarterly data on individual institutional investors, this chapter studies the international transmission of monetary policy conducted by major advanced economies on the cross-border portfolio allocation of large institutional investors. The results reveal that in response to unconventional monetary policies, large institutional investors contributed to the surge in capital inflows to emerging markets and developing countries. While institutional investors contributed to the international transmission of monetary policy, the results also reveal that these policies prompted institutional investors to increase allocation at home. The results show cross-border transmission effects supportive of the portfolio balance and risk-taking channels of monetary policy transmission.

The third empirical chapter examines whether foreign direct investment responds

symmetrically to domestic and foreign uncertainty. The response of foreign direct investment to different types of uncertainty is empirically examined using the gravity model technique. Using bilateral foreign direct investment flows, the results reveal that multinational corporations respond heterogeneously to different types of uncertainty. Furthermore, this response is distinct between advanced economies and emerging markets economies recipients. Greater uncertainty regarding financial markets in the destination country deters foreign direct investment into the economy. However, this effect is only relevant for outward foreign direct investment going to advanced economies and is not relevant for emerging market and developing host countries. Political uncertainty in the host country reduces foreign direct investment to developed country destinations with no significant effects found for developing host countries. Similarly, macroeconomic uncertainty is only relevant in driving foreign direct investment flows to advanced economies. The empirical findings suggest that multinational corporations will respond to this aspect of uncertainty regarding economic activity in advanced economies and not in emerging market and developing economies. Generally, economic policy uncertainty in in both source and host countries discourages multinational corporations undertaking foreign direct investment activity. This negative effect is stronger for host country economic policy uncertainty. Nevertheless, there are distinct effects when country groups are considered. For foreign direct investment going into developed countries, higher economic policy uncertainty in the host country deters foreign direct investment inflows into the economy. Therefore, from the perspective of advanced economies, greater economic policy uncertainty is detrimental for attracting foreign direct investment in inflows. In contrast, for emerging market economies, economic policy uncertainty in the home country of the multinational corporation is found to be more important. This finding suggests that heightened economic policy uncertainty in the home country of the multinational corporation discourages outward foreign direct investment. This corroborates prior evidence in the empirical literature highlighting the relevance of the role of external supply-side factors in driving inflows to emerging market and developing host countries.

# Contents

# List of Tables

# List of Figures

# Acknowledgements

I would like to express my sincere gratitude to my supervisors Professor Ronald MacDonald and Dr Celine Azemar for their patience, encouragement, support and guidance throughout my PhD research.

Thank you to Cameline Orlendo, Angela Tabiri, Shadrach Dare, Patrice Reid, Norma De Vilbiss, Simon Naitram, Shane Lowe, Spyridon Lazarakis and Johanna Tiedemann for your friendship and support during the PhD. To my family, thank you for your love and support during this entire journey. To God be the glory.

I am grateful to the Commonwealth Scholarship Commission (CSC), the Canon Collins Trust and the University of Glasgow Hardship Fund for the financial support granted to support my PhD studies.

# Dedication

*This thesis is dedicated to my parents.*

# Author's Declaration

I declare, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

Jessie Nabulambo Kilembe
Glasgow, November 4, 2019.

# Chapter 1

# Introduction

Financial integration among countries has increased over time. Total global outward foreign direct investment flows have progressively increased with emerging and developing countries (EMDEs) constituting the major recipients of world foreign direct investment. Although, most foreign direct investment activity emanates from advanced countries with the highest volume of cross border activity occurring between advanced economies, cross-border direct investment activity in emerging and developing countries has been steadily increasing. Accordingly, the volume of foreign direct investment inflows to developing countries, reached a historically high level, and surpassed cross border investment to developed countries, accounting for 52 per cent of world foreign direct investment inflows in 2012 (UNCTAD, 2013) and 54 per cent by 2013 (UNCTAD, 2014). This was on the backdrop of the global economic turmoil following the global financial crisis, corroborating the enhanced financial integration that has taken place as well as the growing importance of these countries as destinations for foreign direct investment.

Analogously, multinational corporations (MNCs) from emerging market and developing economies have increasingly become investors pursuing growth opportunities abroad particularly in other developing countries, elevating the portion of world outward foreign direct investment originating from emerging market and developing economies (Cai et al., 2019). Major source countries of this enhanced magnitude in South-South foreign direct investment flows (investment from developing countries to developing countries) include major emerging market economies of Brazil, Russia, India, China and South Africa (BRICS). These countries have considerably increased their share in global outward foreign direct investment to other developing nations in recent years. Similarly, by 2012 the volume of outward investment arising from developing countries as financiers to other countries represented one third of world outflows

(UNCTAD, 2013). This subsequently rose to 39 per cent by 2013 a substantial increase from 12 per cent registered in the early 2000s, (UNCTAD, 2014).

The increased financial integration among countries and the unique positioning of emerging market and developing economies has coincided with the improving financial markets in various regions across the world. Accordingly, access to stock and debt markets as sources of finance will influence firm investment decisions. However, firm access to capital markets across countries varies and this will influence the degree with which firms choose to use either internal or external sources of capital to facilitate production and expansion. Specifically, for the multinational corporation, the role of credit conditions in both source and host country may influence the incentive for foreign direct investment decision. At home, growing capital markets will ameliorate credit constraints and facilitate the multinational corporations' expansion into foreign markets (Di Giovanni, 2005). Whereas, it has been shown that destination countries' credit conditions may either encourage or deter the incentive of the multinational corporations to pursue foreign direct investment and the type of foreign direct investment multinational corporations chooses to engage in (Desbordes and Wei, 2017; Alfaro and Chauvin, 2016). In the aftermath of the global financial crisis, the demand for foreign direct investment and goods produced by foreign affiliates was adversely affected by demand shocks arising as a result of lower global GDP. Furthermore, as a consequence of the global financial crisis, credit conditions became constrained, negatively impacting the capacity of firms to finance foreign direct investment activities abroad (Sauvant et al., 2010). Chapter 2 of this thesis analyses how external financing conditions affect foreign direct investment. It examines the role of financial development in both the source and host country in sequencing the cross-border direct investment activity of multinational corporations. The thesis also considers how changes in credit conditions during the global financial crisis and in countries that experienced a domestic systemic banking crisis affected bilateral foreign direct investment.

The negative repercussions of the global financial crisis on financial markets and real economic activity compelled the use of expansionary monetary policies by central banks in major advanced economies in efforts to revive economic activity. Major central banks lowered policy rate until they reached the zero-lower bound. Consequently, the major central banks shifted from using conventional monetary policy tools to unconventional monetary policy tools. One such tool was the large-scale outright purchase of assets or quantitative easing by central banks in advanced economies. This increased the size of the central bank balance sheets and altered the volume of assets to the public for investment. While a low interest rate environment aids economic recovery, it also alters the risk-taking behaviour of households, banks and other investors (Ammer et al., 2018). The low interest rate environment in advanced economies has

been shown to have influenced a shift toward allocation to riskier assets by investors searching for high yield. For example, this search for yield investment behaviour has resulted in cross-border investors allocating more assets to emerging markets (Bonizzi, 2017). While the enhanced appeal of emerging markets and developing economies as attractive destinations for investment from abroad is beneficial for the recipients it also comes with costs. With increased integration between economies through both real and financial channels, unconventional monetary policies adopted by major systemic countries generated unintended consequences for other economies. Moreover, it has been shown that the spillovers from the international transmission of unconventional monetary policies conducted by central bank in advanced economies have been large for emerging and developing countries (Ahmed, 2013; Fratzscher et al., 2016; Neely, 2015). Risks identified include the anticipation of the normalisation or reversal of expansionary monetary policy being associated with the depreciation of nominal currencies and reductions in stock market prices in emerging markets (Eichengreen and Gupta, 2015).

Chapter 3 of this thesis examines the international transmission of monetary policy through the cross-border portfolio allocation of global institutional investors. Capital flows have been closely linked to movements in the business cycle. The global financial cycle or co-movements of capital inflows, asset prices and credit growth are not attuned to domestic macroeconomic fundamentals (Rey, 2015). This is an important policy concern for emerging market and developing countries as been recipients of large volumes of capital inflows from abroad in recent times. Furthermore, the global financial cycle is also linked to co-movement with uncertainty or global risk aversion. This implies that shifting external financial conditions, investor sentiment and the accompanying fluctuations in external financial flows pose significant risks of generating macroeconomic instability for these countries, through sudden stops and retrenchment of capital flows. This has induced investigation into the determinants of capital flows (Ahmed and Zlate, 2014) and the sensitivity of capital flows to evolving external financial conditions such as the global financial crisis, (Milesi-Ferretti and Tille, 2011) and the role of financial flows as conduits in magnifying the effects of shocks.

Evidence on the movement of gross capital flows suggests that capital inflows and capital outflows have become increasingly correlated. A sudden stop or decline in capital inflows occurs alongside of a retrenchment or decline in capital outflows (Davis, 2015). Furthermore, it has also been found that this unidirectional movement of capital inflows and outflows is largely driven by the business cycle. Moreover, sudden stops or retrenchments exert stronger effects in periods of recession (Broner et al., 2013; Davis, 2015)) and these effects have intensified with financial integration (David et al., 2015). Nevertheless, this positive correlation in the movement of capital inflows and capital outflows remains a puzzle, making both the determinants and response of capital flows

to shifting external financial conditions the focus of recent research.

Several theoretical propositions have been made in the literature on the probable reasons for the puzzle on the co-movement between a sudden stop in capital inflows and a retrenchment in capital outflows. (Tille and Van Wincoop, 2014) underscore the importance of heterogeneity among investors and private information in explaining the co-movement. They consider that investors will have diverse portfolios, encounter distinct frictions and respond differently to a shock in fundamentals. However, the correlation between inflows and outflows may be attributable to the different information sets available to external and domestic investors. Tille and Van Wincoop (2014) suggests the pattern of correlation exhibited by capital inflows and outflows may be due to information asymmetry between external and local investors, a reflection of the varied information and expectations of both groups. Gourio et al. (2016) argue that external and local investors are subject to varying degrees of uncertainty arising from different government policies that may directly or indirectly alter conditions between external and local investors. These implicit or explicit factors may include, capital controls, taxes, risk of expropriation and exchange rate risk.

On the other hand, Caballero and Simsek (2018) proposition that the fickleness of capital inflows may arise from external investors response to adverse conditions in the host country. When financial distress occurs in a host country, investors will tend to retreat away from the host country in crisis and lean toward their domestic market. On the other hand, domestic distress in the source country may result in a reduction in capital outflows as investors reverse investment abroad. In these conditions, there will be a correlation in the movement of capital inflows and capital outflows. Caballero and Simsek (2018) postulate the cause of fickleness or retrenchment inflows as the result of investors reacting to information asymmetry or Knightian uncertainty, specifically asymmetry in regulation and poor property rights. Nevertheless, limited evidence exists on these hypotheses. Chapter 4 of this thesis addresses the question of whether there is a differential response of investors to external and domestic uncertainty. Specifically, it addresses the question of how bilateral FDI flows from country $i$ to country $j$ respond to uncertainty in country $i$ and country $j$ measured by uncertainty regarding different aspects of the economy.

The remainder of the thesis is structured as follows. Chapter 2 provides the empirical study on the impact of country-specific financial market development on bilateral foreign direct investment. Chapter 3 examines the international transmission of monetary policy conducted by central banks in major advanced economies on the cross-border portfolio allocation of large institutional investors. Finally, chapter 4 analyses the response of foreign direct investment to the domestic and foreign uncertainty. The

empirical analysis examines the response of foreign direct investment to different types of uncertainty. Chapter 5 concludes with the overall findings of the thesis and potential avenues for further research.

# Chapter 2

# Financial Development and Bilateral Foreign Direct Investment

## 2.1 Introduction

Access to financial resources will shape firm investment decisions. However, disparities in the accessibility of capital among countries will determine the extent to which the firm uses internal and external finance to support production and expansion. The existence of inadequately developed financial institutions or financial constraints can preclude firms from attaining the external resources necessary for investment. The growth in financial markets will ease credit constraints and enable firms to undertake investment ventures in external markets (Di Giovanni, 2005). Firms constrained due to financial conditions at home will engage in less outward foreign direct investment (FDI) (Klein et al., 2002). However, the effects of having a well-developed financial sector for foreign direct investment in the host country is ambiguous. Credit constraints in the host country could either be beneficial and result in more foreign direct investment or could be detrimental to Multinational corporations (MNCs) incentives to invest (Desbordes and Wei, 2017).

A well-developed financial system permits firms access to capital to pursue investment opportunities. Multinational Corporations engaging in cross border activity incur significant initial costs which may not be fully covered from internally generated funds (Bilir et al., 2014). This necessitates the need to access external capital to fund investment abroad. The extent of financial development at home will have an influence on the capacity of firms to access capital. Financial constraints arising from weak financial institutions and disruptions to the supply of capital during a crisis will affect the

access to credit and ability to invest for these firms. With underdeveloped financial markets, budding entrepreneurs are inhibited from accessing capital to harness innovations brought by external capital, limiting the potential for expansion into export markets (Alfaro et al., 2004). An improved financial system results in alleviated credit restrictions for local firms, promoting greater intermediary production, which could enhance foreign direct investment inflows from abroad as host country firms provide inputs (Alfaro et al., 2010).

This chapter addresses the question of how external financing conditions influence foreign direct investment. It focuses on the dual effects of financial development in both source and host country and the implications for outward foreign direct investment. Financial development in the source country will facilitate the capacity of foreign firms to enter new markets (Di Giovanni, 2005). The financial conditions in the host country will determine whether foreign investment occurs and in what form the foreign direct investment will take (Alfaro and Chauvin, 2016). Changes to the availability of capital due to tightening credit conditions arising from a financial crisis will also have implications for foreign direct investment. This crisis effect might be beneficial or deleterious to foreign direct investment. Exogenous shocks to the supply of credit or crises are anticipated to have a negative impact on outward foreign direct investment as firms are unable to gain the access to expand abroad.

Following the global financial crisis, the demand for foreign direct investment and goods produced by foreign subsidiaries were adversely affected by demand shocks in the form of lower global GDP. Supply side factors related to tighter credit conditions owing to the global financial crisis also impacted the capacity of firms to finance foreign direct investment activities abroad (Sauvant et al., 2010). The crisis resulted in two outcomes related to foreign direct investment, reduced demand and reduced credit (Gil-Pareja et al., 2013). These outcomes arose through the foreign direct investment extensive margin, lowering investment abroad or through the intensive margin of foreign direct investment, lowering the size of investments.

This analysis considers changes to external financing conditions during the global financial crisis and in countries that experienced systemic banking crisis and the implications for foreign direct investment. However, a closer look at the type of crisis may be warranted. Foreign direct investment is considered to be more stable compared to other foreign inflows which are prone to reversals from host countries in times of crisis. During periods of financial distress, host countries may register greater inflows. A failure in the domestic financial intermediation process in the host country presents opportunities for foreign direct investment from foreign firms (Stoddard and Noy, 2015). The type of crisis will influence the form of foreign direct investment and

attractiveness of the host country for investment. Horizontal foreign direct investment aimed at accessing the local market in the host country will likely be adversely affected where a crisis leads to a contraction in the real economy as it will not be profitable for the multinational corporations to invest. On the other hand, vertical foreign direct investment seeking to lower production costs may benefit from wealth effects arising from currency depreciation (Stoddard and Noy, 2015). This wealth effect may result in more foreign direct investment as it is cheaper for foreign investors to acquire assets in the host country following a currency depreciation (Froot and Stein, 1991).

This chapter contributes to the literature focusing on the link between multinational firm activity and external financing conditions. Prior work has explored the simultaneous influence of source and host country financial conditions on greenfield Foreign direct investment, expansion and mergers and acquisitions (M&A) foreign direct investment (Desbordes and Wei, 2017), greenfield foreign direct investment and reinvestments (Gil-Pareja et al., 2013), Mergers and acquisitions foreign direct investment (Coeurdacier et al., 2009), aggregate foreign direct investment (greenfield and mergers & acquisitions) (Donaubauer et al., 2016). This chapter uses recent data to investigate the role of financial development in both source country and host countries for total outward bilateral foreign direct investment (greenfield and mergers & acquisitions). It further examines the role of changes to credit conditions during crises and the implications for outward foreign direct investment. Tightened credit conditions arising from the global financial crisis and country specific conditions in source and host countries following a systemic banking crisis are considered.

The focus of the analysis is emerging and developing economies (EMDEs) as they constitute the major recipients of world foreign direct investment. The volume of foreign direct investment inflows accounted for 52 % of world foreign direct investment inflows in 2012 (UNCTAD, 2013), surpassing cross border investment to developed countries and rose to 54% by 2013 (UNCTAD, 2014). This was against the backdrop of the global economic turmoil following the global financial crisis, attesting to the growing importance of these countries as destinations and the confluence of both external and internal factors as drivers of foreign direct investment to these countries. Although, most foreign direct investment activity emanates from advanced countries with the highest volume of cross border activity occurring between advanced economies, cross border activity in emerging and developing countries has been steadily increasing. Firms from emerging market and developing economies have increasingly become investors pursuing growth opportunities abroad particularly into other developing countries, elevating the portion of world outward foreign direct investment originating from emerging market and developing economies. By 2012, the volume of outward investment arising from developing countries as financiers to other countries represented one

third of world outflows (UNCTAD, 2013). This subsequently rose to 39 per cent by 2013 a substantial increase from 12 per cent registered in the early 2000s (UNCTAD, 2014). The research considers both developed and emerging economies as source countries of outward foreign direct investment.

The analysis estimates the impact of credit constraints on bilateral foreign direct investment to emerging market and developing economies. To exhibit how the different financing arrangements, shape the pattern of foreign direct investment to emerging markets and developing economies, the inclusion of financial deepening characteristics is applied to both originating and destination countries. The analysis will seek to explore the degree with which foreign direct investment is driven by credit constraints in a bilateral country-pair setting incorporating other determinants of foreign direct investment. It expands this literature on the role of financial development in shaping the activity of multinational corporations.

This analysis finds that a well-developed financial sector in the source country is beneficial for outward bilateral foreign direct investment. This chapter also finds that the tightening of credit conditions in source countries experiencing systemic banking crisis adversely affected outward bilateral foreign direct investment to emerging market and developing economies. Constricted external financing conditions for host countries experiencing systemic banking crisis facilitated greater foreign direct investment.

The main policy implications of the chapter relate to both source and host countries. Countries seeking to enable the entry and growth of multinational corporations into foreign markets and those countries seeking to encourage inward foreign direct investment from multinational corporations should execute policies that will enhance financial development. Secondly, these countries ought to put in place policies to sustain access to external financing for firms in periods of severe financial distress. Furthermore, better developed financial systems are important as they will safeguard the access to external financing by local firms as domestic borrowing by multinational firms expands (Desbordes and Wei, 2017). Therefore, having a well-developed financial system will be advantageous for both domestic and external investors.

The rest of the chapter is organised as follows. Section 4.2 provides the background and the distinct ways in which financial development in both source and host countries' financial development may influence foreign direct investment. Section 2.3 describes the empirical methodology and the data. Section 4.5 provides the results and section 4.6 concludes.

## 2.2 Literature Review

### 2.2.1 Financial frictions and foreign direct investment

According to Foley and Manova (2015), capital market considerations were deemed by prior literature as secondary for the firm decision to undertake foreign direct investment abroad. The multinational corporation's foreign direct investment decision is examined as being a firm-specific strategic decision, made primarily to exploit a particular advantage. This firm-specific advantage could be in the form of intangible assets such as patents, brands and intellectual property rather than one dictated by capital markets or disparities in interest rates across countries. The ownership, location and internalisation (OLI) paradigm explain multinational corporations' motivations for owning assets abroad. Ownership advantages arising from firm-specific valuable assets, the capacity to locate in multiple locations and the internalisation of operations due to costs can also explain the role of multinational corporations' as sources of foreign inflows as well as owners of assets (Alfaro and Chauvin, 2016).

The literature from corporate finance provides perspectives on the probable channels through which financial restrictions may affect the global pattern of foreign direct investment as well as trade. Earlier studies generally assume firms as having unfettered access to funds required to undertake investment ventures (Foley and Manova, 2015). Forssbaeck and Oxelheim (2011), suggest that the efficient market hypothesis and assumptions of complete financial markets and integration of financial markets led to the subordination of firm financing as a potential determinant of foreign direct investment compared to other conventional factors considered previously within the literature. Prior literature has emphasised disparities in firm productivity as a driver of foreign direct investment. This entailed the least productive firms producing for the domestic market, the relatively productive exporting and the most productive firms entering new external markets (Helpman et al., 2004).

Nevertheless, firm financing choices may not be endogenous to foreign direct investment. Firms may have no need for external capital if there are no new profitable markets to expand into. Thus, in this case the firms will report less use of external capital and low foreign direct investment, although not financially restricted and the firm will not seek access to capital. Alternatively, firms with potential profitable ventures will report less use of external capital if they are credit constrained and have no means to expand to prospective markets. Thus, the condition of the financial system will determine the relative ease with which firms can raise capital through the issuance of debt and equity securities, the extent of protection conferred to creditors and the

degree of enforcement of contracts (Foley and Manova, 2015). In a country with an underdeveloped capital market, firms may be restricted in obtaining capital to pursue investment and expansion. Local financial conditions and the ease of access to credit could impose a constraint to firms' expansion activities abroad.

Financial deepening with respect to the size and liquidity of capital markets is essential in supporting foreign firm investment abroad (Jongwanich et al., 2013). Financial development allows firms the capacity to obtain external finance to pursue investment ventures abroad which they would have otherwise forfeited (Di Giovanni, 2005). Since financial systems across countries are heterogeneous, the level of credit available and the cost of acquiring external finance by firms is likely to varied. Firms are likely to obtain finance to undertake viable investments with relative ease in countries with a better developed financial market (Levine, 2005). The existence of differential access to capital across countries can also be conditioned by legal traditions which impact credit markets outcomes (La Porta et al., 1998, 2008). For example, the legal convention in a country determines the conduct toward protection of property rights (Fernández and Tamayo, 2017). Stronger financial institutions which provide for adequate enforcement of contracts and the protection of creditor rights will result in destination countries receiving more foreign direct investment or hosting more multinational corporations unlike those with weaker institutional frameworks for financial contracts (Buch et al., 2009).

**Funding costs and differential access to capital**

The underlying financial conditions within which the firm operates will generate variations in foreign direct investment outcomes. Accordingly, both domestic and multinational firms face significant initial costs when choosing whether to undertake production, export or enter foreign markets all of which require financing (Foley and Manova, 2015).

Markusen and Maskus (2002), highlight that the origins of financing for multinational corporations can be seen as separate from the parent firm in the source country. Owing to their presence in multiple countries, multinational corporations have the capacity to raise resources from one location and transfer them to another subsidiary elsewhere through internal capital markets to circumvent local financial restrictions (Desai et al., 2004). In comparison to domestic firms, multinational corporations have a distinct advantage for overcoming financial frictions if conditions are constrained in the location in which they are domiciled. While both multinational corporations and domestic firms can be perceived to be affected by the conditions in the local financial

system, the domestic firm is solely restricted to the market within which it operates. The response of multinational corporations is to use internal capital markets. Despite multinational corporations attaining capital elsewhere in comparison to domestic firms, they are still responsive to changes in local financial conditions (Foley and Manova, 2015). This implies that the type of foreign direct investment that multinational corporations choose to engage in may arise from financial constraints in an underdeveloped capital market in the host country.

In comparison to affiliates based in locations with well-functioning capital markets, affiliates in locations with inadequate protection of creditors and weak financial institutions use less external capital and more internal capital from the parent company. This is due to the expensive cost of funds from external providers. In the presence of underdeveloped capital markets, the difference between the cost of external funds and internal sources is greater (Noe, 2000). Alternatively, the financial advantage of multinational corporations in terms of foreign direct investment can also be viewed in the context of exchange rate effects. Wealth effects arising from exchange rate changes exogenous to firm profits can impact foreign direct investment (Forssbaeck and Oxelheim, 2011). Following an exchange rate appreciation, the changes in wealth of foreign investors supports the purchase of cheaper assets abroad (Froot and Stein, 1991). The concomitant increase in wealth reduces the cost of capital for the multinational corporation to pursue investment abroad.

Considering that the amount of internal capital at the disposal of the firm is limited, this leads to the need to acquire resources externally to fund the fixed costs associated with production, export or foreign direct investment activities (Bilir et al., 2014). Therefore, the capacity of firms to cover the fixed costs of undertaking investment abroad may be affected by credit constraints. Bilir et al. (2014) highlight that financial institutions can impact the distribution of foreign direct investment across countries owing to firms' need to source external financing to meet the fixed costs to production. How these expenses are met is sensitive to firm-specific financing choices of whether to use debt or equity and also to the underlying financial conditions.

### Information asymmetry and foreign direct investment

The firm choice on the type of foreign direct investment to undertake in a given country will vary dependent on the extent of financial frictions and the level of development of financial systems. Accordingly, financial constraints might arise due to agent's sensitivity to information frictions or costs (Fernández and Tamayo, 2017). Since, firms operate in imperfect markets characterised by moral hazard and adverse selection,

these information frictions may exacerbate financial constraints, leading to costly and lower volumes of capital being extended (Foley and Manova, 2015). Foreign direct investment is more sensitive to information asymmetries than other types of capital inflows (Froot and Stein, 1991). The capacity of the firm to obtain external capital from investors is influenced by information asymmetry and managerial behaviour, or by moral hazard considerations as espoused by Myers and Majluf (1984) and Jensen and Meckling (1976), respectively. These corporate governance characteristics can influence the foreign direct investment decision and shape the form of ownership structure multinational corporations take when entering destination countries for foreign direct investment.

Alternatively, the imperfect integration of capital markets may also be exploited by multinational corporations behaving as arbitrageurs, as illustrated by Baker et al. (2009). They advance a *cheap financial capital hypothesis* in which overvalued firms in the source country take advantage of less costly funds available to them. In this scenario, over-valuation by the multinational corporation will arise due to managers having a firm-specific information advantage over investors. In this case, moral hazard arises due to the potential misconduct by managers seeking to advance self-interests at the expense of the investors as owners of external capital.

Baker et al. (2009) further propose a *cheap assets hypothesis*, where foreign direct investment arises due to the undervaluation of assets in the host country. Hausmann and Fernandez-Arias (2000) corroborate this and postulate that, within a poorly developed financial market, a local firm with limited access to international capital markets will encounter restrictions in growth due to constraints in obtaining finance. This will be evident in low firm growth prospects and high discount rates in valuation. Whereas, a multinational corporation as a potential buyer not impeded by such restrictions will value the domestic firm with high revenues or lower discount rate. Domestic firms in the destination country facing capital inadequacies will be compelled to sell to multinational corporations with superior access to capital. Forssbaeck and Oxelheim (2011) refers to this as the *discount factor financing effect* on foreign direct investment which captures the motive of multinational corporations responding to imperfect capital markets and the attendant disparities in stock valuation in the presence of information asymmetry. The pricing differential in valuations generates the possibility of arbitrage for the foreign firms (Foley and Manova, 2015). In this case, multinational corporations engage in foreign direct investment based on the dual effect of an arbitrage opportunity and the weak state of capital markets in host countries (Alfaro and Chauvin, 2016).

**Contract enforcement and foreign direct investment**

The type of engagement multinational corporations opt for abroad will entail considerations of a trade-off between ownership and control and financing. The effectiveness of institutions that uphold the protection of property rights and the enforceability of contracts will condition the security and operations of the financial sector (Fernández and Tamayo, 2017). These institutions may arise from the legal traditions emanating from the English, French, German and Scandinavian legal systems which influence the corporate law and finance nexus (La Porta et al., 1998). Institutions conditioning outcomes in the financial sector assist in lowering the effects of information asymmetry in a number of ways (Fernández and Tamayo, 2017). Firstly, they provide buffers against adverse selection and unequal negotiation abilities between controlling and minority shareholders rights. Secondly, they provide an autonomous judicial framework which facilitates the enforcement of contractual obligations.

The role of corporate governance with respect to the enforceability of contracts can also be taken into consideration in the context of foreign direct investment. This applies in the case where the foreign direct investment decision arises to exploit a firm-specific advantage. Foley and Manova (2015) stipulate that, the incentive to undertake investment in external markets is compelled by the existence of intangible assets with monetary value for the firm. These firm-specific intangible assets could include patents, brands or proprietary knowledge and technological advances. These intangible assets compel multinational corporations to enter markets in which they would have a comparative advantage. Intangible assets in turn influence the type of ownership and control structure that multinational corporations assume in the destination country. The degree of enforcement of property rights and the prospect of agency problems between managers and investors will determine whether foreign investment takes the form of an arm's length operation (i.e. through third-party sellers or suppliers) or corporate control and physical establishment in the destination country. Therefore, the form of ownership and the degree of control multinational corporations exert on their assets in external markets will depend on the extent of corporate governance and institutional quality prevalent in the host countries they operate in. Consequently, the firm's decision to locate abroad is encapsulated by the decision either to control and manage its interests directly in the new market, or through the establishment of linkages such as arm's length operations. Therefore, intangible assets will influence multinational corporations' decision on whether to relocate and keep proprietary knowledge and expertise within the firm or engage with partners in the destination country.

Alternatively, deficient financial markets and the lack of attributes such as sound

contractual enforcement present in some host countries instigates the choice for foreign firms to engage in foreign direct investment activity (Hausmann and Fernandez-Arias, 2000). Foreign firms will find it more cost-effective to access external finance at home and allocate funds to the domestic firm through foreign direct investment to substitute for the absence of efficient debt markets. They argue that, investors from the source country will prefer to purchase assets in countries with weaker financial development.

The institutional environment, governing financial contracts and the protection of creditors varies across countries. Buch et al. (2009), posit a firm can either establish an affiliate, or alternatively enter and replicate operations to serve a foreign market. Both decisions entail fixed costs to entry, and they advance a model where insufficient internal capital will propel the requirement for external funds by the firm. However, access to external funds(bank credit) is reliant on the firm's provision of collateral assets to the lender (domestic or foreign bank). In the event of a default, the lender faces considerable transaction costs to liquidate the assets. Within the Buch et al. (2009) model, the decision to invest abroad can be impacted by inadequate contract enforcement and liquidation costs which can be associated with both financial development and the existence of source country banks abroad. The source country bank will undertake better enforcement, monitoring and have reduced information asymmetry on the parent firm in comparison to the domestic banks in the host country. Because the source bank mobilises superior quality of information on the foreign affiliate, it ensures enforceability of repayment of credit or collateral provisions in event of liquidation, thereby reducing the cost of funds, bolstering lending. Host countries with superior enforcement of contracts and effective liquidation processes will receive more multinational corporations. On the other hand, destinations with paucity in contract enforcement are recipients of fewer multinational corporation subsidiaries.

Antras et al. (2009) concur; the choice to engage in either greenfield investments, mergers and acquisitions or arm's length transfer of technology, is influenced by the extent of financial sector development in the host country. Given the existence of the intangible assets and the need to protect them, multinational corporations may be wary of managerial misbehaviour in the host country. However, in countries with well-developed financial institutions the likelihood of managerial misbehaviour or moral hazard is lower. Lenders will not need for the multinational corporations to possess an equity stake to ensure monitoring and profit maximisation but rather institutional quality (financial development) ensures monitoring of managers and protection of creditors (investors). In this case, the multinational corporation may engage in the host country at arm's length and not through direct foreign direct investment. Therefore, a well-developed host financial sector could generate an adverse effect. Multinational corporations will not be compelled to undertake foreign direct investment as a means

of corporate control of assets abroad, lowering this form of investment.

Information asymmetry (moral hazard and adverse selection) and institutional environment influence the location, integration into the local market and corporate governance of multinational corporations' operations (Foley and Manova, 2015). The theoretical underpinnings in Bilir et al. (2014) posit that, a multinational corporation based in a country with a better developed financial market may not always have access to the funds it requires. Financial institutions in the source country may be unwilling to finance ventures abroad. The potential risk of being unable to fully make collateral claims abroad will dissuade financiers from supporting multinational corporations. Bilir et al. (2014), assert that financial development in the destination country will enable previously constrained domestic firms to enter the market, making it less competitive for multinational corporations' operations, in sectors reliant on finance. This can have an adverse effect of reducing foreign direct investment, as prior constrained local firms are accorded greater access to finance owing to improved financial conditions. Bilir et al. (2014), also show how financial development in the destination country can alleviate the financial constraints of the multinational corporations. They conclude that, financial frictions influence not only the decision to undertake foreign direct investment, but also the volume and the type of foreign direct investment whether, horizontal or vertical.

### 2.2.2 Direct and indirect effects of financial development on foreign direct investment

Firms relying on external finance to undertake their operations or invest in new activities domestically can be anticipated to require external finance to fund growth abroad. Similarly, firms differ in their financing patterns due to their varied ability to access external finance from capital markets (Desbordes and Wei, 2017).[1] Di Giovanni (2005) asserts that, a developed financial sector allows firms to embark on ventures they would have previously foregone. Additionally, mergers and acquisitions permit firms to expand their activities of outward foreign investment into other countries, which also intensifies financial integration among countries.

Financial development refers to the mechanisms through which financial interme-

[1]Other literature has focused on heterogenous firms and the impact of financial frictions on trade activity. Evidence shows that, in sectors more reliant on finance access to capital enhances export activity. Manova (2013), derives a conceptual framework highlighting that, the fixed initial costs to exporting are impacted by financial constraints and the heterogeneity of firms drawing from earlier work by Melitz (2003). Manova (2013)'s findings reveal that lower developed financial causes reduced destination markets, diminished export products and results in less total trade.

diaries and markets lower costs to enable trade, risk diversification and the pooling of savings. Financial institutions and contracts arise in order to ease the costs of extending credit such as the gathering of information, enforcement of contracts and transaction costs. Financial sector development refers to the amelioration of the information, enforcement and transaction costs the financial sector incurs in the process of extending credit. In comparison to a firm operating in an underdeveloped financial system, financial development will ease the credit constraints encountered by the firm operating in a country with a well-developed financial sector. Therefore, financial development can be seen as an indirect measure of the availability and access to credit by firms. The extent of financial development will influence the volume of credit available to firms and can impact their ability to engage in cross border activities. The financial sector is an important element of cross border activity as it supports and enables the undertakings of multinational firms such as exports (Manova, 2013), mergers and acquisitions (Di Giovanni, 2005) and direct investment abroad (Liu and Qiu, 2014).

### Source country financial development effects

Desbordes and Wei (2017) elucidate the various direct and indirect ways through which financial development may influence the pattern of foreign direct investment. Focusing on financing effects, they delineate the dual role of financial development in both originating and destination countries. There are two probable unequivocally beneficial effects through which source country financial sector development influences foreign direct investment. Desbordes and Wei (2017) highlight the following potential effects for source financial development on foreign direct investment:

**Positive direct external access to finance effect.** Source country firms more reliant on external finance will have access to funds enabling them to cover the significant costs of expanding and investing in profitable opportunities abroad. For this reason, there will be a direct positive external access to finance effect emanating from a better developed financial sector in the source country (Desbordes and Wei, 2017).

**Positive indirect access to finance effect.** Better developed financial sector may have a positive indirect effect (Desbordes and Wei, 2017). In addition, with greater access to finance within the home country, the activities of local firms will be enhanced by contributing to the general expansion and entry of firms particularly in sectors more reliant on external finance (Rajan and Zingales, 1998). This yields greater competition which is associated with two competing outcomes. The entry of new competitors in the market could instigate other firms to pursue new markets abroad.

**Negative indirect competition effect.** Conversely, there may be a negative competition effect, where the increased number of firms entering the market results in the reduction of profits for each firm in the sector. This could curtail the capacity of firms to invest abroad owing to the indirect negative competition effect (Desbordes and Wei, 2017).

### Host country financial development effects

There is variability in the postulated effects of host country financial development on foreign direct investment. Capital market conditions in the host country influence whether foreign investment is undertaken and whether it is financed through foreign direct investment (Alfaro and Chauvin, 2016). Desbordes and Wei (2017) elucidate four contrasting effects of host financial development on foreign direct investment as follows:

**Positive direct external access to finance effect.** In an adequately developed financial sector in the host country, a positive access to finance effect will arise (Desbordes and Wei, 2017). The magnitude of foreign affiliates activities in the host country will be enhanced if a proportion of the external finance requisite for investment is sourced within the host country. Domestic financial sector development will ease financing constraints by availing external finance to both local and foreign investors alike from the domestic capital market and this will be advantageous for firm access to resources. Lenders in the source country may be unwilling to finance ventures abroad. The potential risk of being unable to fully make collateral claims abroad will dissuade financiers from supporting multinational corporations. Bilir et al. (2014), show that greater host financial development can alleviate the financial constraints of the multinational corporations' affiliates. Alfaro and Chauvin (2016) concur and surmise that, host country conditions attract foreign direct investment because foreign firms can finance part of their operations locally. Access to the domestic capital market by multinational corporations will be more advantageous than home country financing as it permits them to hedge against exchange rate risk of sales or costs associated with the trading in the host country currency.[2]

**Negative direct disintegration effect.** Conversely, better host country financial development may result in a negative disintegration effect (Desbordes and Wei, 2017). External investors might have the impetus to substitute foreign financing because the developed financial system in the host country is able to adequately perform its in-

[2]Alternatively, the volume of credit available in the domestic economy is enhanced when multinational corporations are present in the domestic market (Harrison et al., 2004).

termediation functions.[3] Accordingly, in the presence of well-developed local financial sector in the host country, foreign investors will be less compelled to undertake outward foreign direct investment with resources obtained from the home country financial sector. Multinational corporations' substitution of foreign direct investment with local funds will result in reduced total foreign direct investment inflows brought by multinational corporations to the host country (Alfaro and Chauvin, 2016). This can also be on account of lenders not requiring multinational corporations to hold equity stakes in investments in host countries with well-developed financial systems as the potential for managerial misbehaviour is lower (Antras et al., 2009). In this case, the multinational corporation may engage in the host country at arm's length and not through direct foreign direct investment. Thus, a well-developed host financial sector could generate an adverse effect. Multinational corporations will not be compelled to undertake foreign direct investment as a means of corporate control of assets abroad, lowering this form of investment.

**Negative indirect competition effect.** Furthermore, a well-functioning financial sector in the host country might result in a negative competition effect (Desbordes and Wei, 2017). The financial sector will implicitly enable local development and augment market size as existing domestic firms are able to expand due to greater access to finance. This encourages and facilitates the entry of additional local firms into the market. As a result, competition intensifies, decreasing the profit for each entity. This makes the host country a less suitable destination for horizontal foreign direct investment seeking local share, particularly from previously financially unconstrained multinational corporations (Bilir et al., 2014). When entry by local firms is limited owing to lack of access to funds or poor financial institutions, multinational corporations have a comparative advantage. The prospect of yielding higher returns in sectors dependent on external finance is greater. In this scenario, the lack of financial development in the host country will act as a pull factor for foreign direct investment as multinational corporations pursue prospectively higher rates of return. This serves as an incentive to enter the host market particularly in those sectors more dependent on finance.

**Positive indirect agglomeration effect.** Finally, with greater access to finance in the host country, expansion of domestic firm activity in sectors dependent on finance may promote the amalgamation between local and foreign firms. The expansion output within an industry tends to create economies of scale, which provide incentives for firms to agglomerate their operations in a given area. The growth of sectors reliant on external finance, may be enhanced when there is greater financial development. For

[3]Nevertheless, excessive borrowing by foreign firms from the domestic capital market can crowd out local firms and exacerbate credit constraints (Harrison and McMillan, 2003).

this reason, there may be a positive indirect agglomeration effect on inward foreign direct investment (Desbordes and Wei, 2017).

This section provides empirical evidence relating financial development to multinational firm activities. It reviews the linkages between firm financing and foreign direct investment by either directly or indirectly incorporating financial market conditions and institutions governing the functioning of financial contracts.

### 2.2.3 Source country financial conditions evidence

Various authors have explored how aspects of home country conditions impact the decision of firms to establish an affiliate or acquire firm assets abroad. The profit maximisation motive of the firm will be modified by two aspects, (Frenkel et al., 2004). These relate to host country characteristics which could potentially affect the return on foreign investment and the changes in the economic environment in the source country influencing the viability and intention for firms to expand abroad, exogenous to host country pull factors. Thus, the profitability of firms as well as the availability of funds for investments is likely to be influenced by the economic situation prevailing in the source country, (Frenkel et al., 2004). With results of foreign direct investment from five major industrial countries to 22 emerging economies, they conclude business cycles in the source countries have an impact on firm's inclination to investment. Cross border activity moves in tandem with swings in the business cycle.

Furthermore, using data on German firms, Buch et al. (2009) analyse the comparative relevance of financial constraints for both parent and affiliate firms. Financial constraints in the source country, faced by parent firms, adversely impacts the extensive margin, the firm choice to enter a new market (horizontal foreign direct investment). Consequently, firms with greater cash flows are more prone to turn into multinational corporations and establish affiliates abroad. If the financial constraints to attaining external capital are severe, the magnitude of foreign direct investment at the intensive margin is lower since expensive fixed costs imply lower internal finance to support production. Thus, evidence suggests smaller, less productive firms with a higher share of fixed assets are unlikely to assume the high initial fixed costs associated with foreign market entry.

Levy Yeyati et al. (2007) using a gravity model establish firms will usually have greater profits to engage in investment both at home and abroad, therefore foreign direct investment outflows would be anticipated to increase during upturns. In recession periods in the US and European source countries, foreign direct investment flows to

developing countries were countercyclical, while foreign direct investment from Japan tended to be procyclical. Furthermore, the comparative rates of return on investment between foreign and domestic investment is likely to induce substitution effects as foreign investors choose between domestic and foreign investment. Additionally, the cost of capital abroad and at home will also matter for the firm investment decision. Levy Yeyati et al. (2007), surmise a reduction in the real interest rates and output gap in source countries is likely to be attendant with greater outward foreign direct investment, especially if the destination country has limited access to capital.

Desbordes and Wei (2017) investigate the impact of financial development on the volume of greenfield foreign direct investment in sectors more reliant on external finance. Firms ability to access external finance or financial dependence Rajan and Zingales (1998) and the ownership of tangible assets suitable to serve as collateral to support external borrowing, (Kroszner et al., 2007) are used to analyse bilateral foreign direct investment of manufacturing firms. These factors can restrict the capacity for firms in sectors more reliant on external finance to initiate investment abroad. Using distinct firm-level data for 13 manufacturing sectors allows for more granular examination of foreign direct investment activity compared to aggregate measures such as BOP data. Desbordes and Wei (2017) exploit both the variation in financial development across countries and financial vulnerability across sectors for bilateral foreign direct investment from 83 home countries(both developed and developing) to 125 recipient countries (both developed and developing) countries. They conclude, in both host and source countries, the magnitude of bilateral foreign direct investment in financially dependent sectors is enhanced with more developed financial sectors.

Donaubauer et al. (2016), explore how the development of the financial sector in both host and source countries has an effect on the level of aggregate outward foreign direct investment (greenfield and mergers & acquisitions) using a gravity model. Unlike Desbordes and Wei (2017), who measure financial development by individual measures of financial development, they capture the effects of financial market development with a composite index comprised of the four characteristics of financial systems, access, stability, depth and efficiency (Cihak et al., 2012). Furthermore, they explore the possible complementarity or substitutability between of financial market development in the host and source countries. Potential endogeneity is accounted for using financial development in geographically contiguous countries and the exclusion of host countries with banking systems consisting of predominantly foreign banks. Using bilateral foreign direct investment stocks, encompassing the period 2001-2012 from 43 investor countries to 137 recipient countries, their findings concur with those of Desbordes and Wei (2017). In both host and source countries, well-developed financial sectors augment bilateral foreign direct investment. Additionally, local and external financial markets act as

substitutes, the paucity in the host country financial markets can be swapped with the access to source country financial market. This is divergent from Desbordes and Wei (2017) who were unable to find significant substitution effects between source and host financial development.

Other strands of literature on the implications of financial market conditions have focused on mergers and acquisitions (M&A). Assessing, financial market conditions in source countries between 1990-1999, Di Giovanni (2005) finds development of both the stock market and financial intermediaries in source countries is beneficial for mergers and acquisitions. Financing through equity markets particularly exerts a larger influence than credit provided from financial intermediaries. Furthermore, he finds evidence of distinct effects of financial structures which vary across countries. Stock markets have significant part in the financing of firms from market-based economies with credit markets having an important though not significant role in bank-based economies.

Coeurdacier et al. (2009) investigate mergers and acquisitions (M&A) between 1985 and 2004 in advanced economies for manufacturing and services sectors with a gravity model. Divergent from Di Giovanni (2005) they control for sector and individual country fixed effects. Their results demonstrate, with better developed financial systems, both source and host countries have greater mergers and acquisitions (M&A) flows in manufacturing and services sectors. Subsequently controlling for fixed effects, results in solely source country stock market capitalisation being significant. Furthermore, changes across time in source country stock market capitalisation are more related to the return on investment in the destination country.

Dailami et al. (2012) investigate the dynamics of bilateral mergers and acquisitions originating from firms in emerging market economies (the global south) to both advanced and emerging host countries. Using 61 emerging countries over the period 1997 to 2010, they find more access to finance through the stock market and the domestic credit market in the source country is linked with more mergers and acquisitions. The capacity of firms to attain capital through equity markets in source country along with the presence of a well-developed financial sector in the host country can enhance mergers and acquisitions. This lessens impediments to financing obstacles with firms being able to pursue horizontal foreign direct investment and mergers and acquisitions. Financial development may result in increased foreign direct investment inflows as it modifies the costs of engaging in investment activities, (Hajilee and Al Nasser, 2015).

### 2.2.4 Host country financial conditions evidence

Host country financial sector development and the implications for foreign direct investment are particularly important for developing countries seeking to attract more external investment. The financial sector, comprised of financial institutions and markets, engaged in the pooling and distribution of capital, can serve as a medium for transmitting foreign inflows to local economic activities, (Murinde, 2012). Furthermore, the local financial market assists foreign firms in countering information asymmetries and facilitates linkages. Foreign investors are able to obtain information on the opportunities and threats in the local market from domestic financial intermediaries alleviating the information anomalies existent between local and foreign investors,(Kinda, 2010).

However, the impact of host country financial sector development in determining the pattern of foreign direct investment across countries is equivocal, Desbordes and Wei (2014). The literature identifies foreign direct investment occurring due to multinational corporations' ownership of intangible assets, the risk of expropriation of proprietary technology and moral hazard in the destination country. Thus, the degree of investor protection or enforceability of contracts and the extent of financial development can impact the magnitude of foreign direct investment activities.

Bilir et al. (2014) using U.S data, accentuate the importance of the host country financial development for multinational corporations' entry into external markets and the level of affiliate sales. This is underscored through a competition effect and a financing effect. They model firms originating from three countries, west and east as identical economies in which firms encounter no restrictions to attaining external capital and a south (low wage country) in which firms are financially constrained. Drawing from Helpman et al. (2004), firms establish a level of productivity once they enter the market. Relatively productive firms from the East and West produce for the domestic and export market. While, the most productive firms establish an affiliate in the South to serve the home market and export to other countries. However, these decisions are reliant on the financial conditions faced by firms in the three countries. Consequently, better developed financial systems in the South enables local firms' entry. This may be detrimental for multinational corporations' activities in the host country market as it enhances competition for foreign firms . This lowers demand for the foreign firm products and consequently reduces affiliate sales in the host country.

Similarly, Antras et al. (2009)using firm-level data establish paucity in investor protection and financial frictions in the host countries as limitations to U.S firms' foreign activities. Modelling a firm seeking to invest abroad with the assistance of a domestic entrepreneur in the host country, the firm contends with two choices. The choice of ei-

ther providing arm's length transfer of technology or alternatively direct participation in the host market through affiliate (equity) ownership and financing. Therefore, foreign direct investment occurs as an endogenous outcome of financial frictions existent within the host country. As such to ensure profit maximisation and monitoring of the venture, lenders demand the multinational corporation's direct participation. Antras et al. (2009) find two contrasting effects. Weak financial systems in the host country lower the magnitude of foreign firm activities; foreign direct investment is characterised by greater ownership by parent companies, with affiliate firms more reliant on parent companies for funds. Due to the need for monitoring, foreign firms are more likely to engage in foreign direct investment than arms-length transactions. Therefore, the lower financial development in the host country will result in more capital inflows. Alternatively, in a host country with a well-developed financial sector and adequate investor protection, foreign direct investment inflows are typified by less ownership by multinational corporations and more arms-length transfer of technology.

Local institutions relating to poor corporate governance and an inefficient financial sector can influence the movement of financial flows, (Ju and Wei, 2010). They hypothesise a model contrasting the movements between financial capital and foreign direct investment flows given prevailing conditions of the financial system. Countries with well-developed financial systems, good corporate governance and better financial intermediaries, are net sources of foreign direct investment on one hand but also draw more capital inflows from abroad. While in emerging market countries with weak financial systems and governance, return on investments is lower. Thus, they tend to have more capital outflows but are net recipients of foreign direct investment due to higher marginal productivity of capital. Therefore, the effect of financial globalisation on this set of countries is indistinct. Foreign investors are able to bypass the inadequately developed financial systems.

Similarly, Hausmann and Fernandez-Arias (2000) suggest, as an alternative for inefficient markets, multinational corporations will seek to establish physical presence abroad especially in locations where the costs of operations and conducting business are great. Therefore, in host countries with diminutive security of property rights, deficient capital markets and institutions, external investors will prefer to operate directly rather than alternate engagement through local intermediaries such as suppliers, franchises. Therefore, foreign direct investment can serve as a substitute to capital markets. Investment would bypass the deficient financial markets and occur directly, undermining the financial intermediation process. They surmise, more investments take place in destinations with weaker institutional environments since foreign firms gain access to sounder institutions and capital markets at home.

The influence of host country financial sector development on the firm's decision to enter markets abroad can be viewed through its effects on whether multinational corporations choose exports or foreign direct investment. Evidence by Liu and Qiu (2014) suggests financial sector development in the destination country encourages the entry of local firms and generates greater competition for foreign firms, shrinking prospective export and foreign direct investment returns. Hence, the improved capacity for firms within the host country to borrow in a well-developed financial sector diminishes both trade and foreign direct investment inflows. This highlights the significance of the development of the domestic financial sector in the destination country for cross border activities.

### 2.2.5 Financial crises and foreign direct investment

Other studies have illustrated the outcome of adverse exogenous shocks to financial conditions in the source and host countries for foreign direct investment activities. Tighter credit conditions for firms can be manifested in the form of disturbances to the cost or supply of external capital.

In times of financial distress in the host country, foreign direct investment motivated by arbitrage opportunities will increase. Multinational corporations will tend to increase investment in distressed countries. These inflows seek to take advantage of undervalued assets which are available in the recipient country,(Aguiar and Gopinath, 2005; Alfaro and Chauvin, 2016). When asset prices in the destination are low or the country is in distress there is an increase in mergers and acquisitions activity as evidenced during the Asian financial crisis.

Gil-Pareja et al. (2013) theorise two probable channels through which a systemic banking crisis may affect FDI. Firstly, the restricted supply of credit that ensues will limit foreign direct investment activity. The ability of firms to invest abroad is restricted owing to tighter access to credit and deteriorating balance sheets. This impacts the capacity of companies to finance the fixed initial costs of investing abroad. Hence, the amount of new investments as well as the operations of existing affiliates is affected. Secondly, the demand shock arising from a decline in global GDP hindered the firm potential to invest as incomes and foreign direct investment are highly correlated. Using firm-level data from a sample of 120 home and 161 host countries between 2003-2010, they find evidence of adverse effects of financial constraints as a consequence of a systemic banking crisis in the home country. Financial constraints negatively affect the number of cross border investment projects undertaken by multi-

national corporations. On the other hand, banking crisis in the host country has no significant influence on foreign direct investment projects. They provide further evidence using three alternate estimation approaches, the Ordinary least squares (OLS), Poisson Pseudo maximum likelihood method (PPML)and the Heckman two stage estimation method. Gil-Pareja et al. (2013) find no evidence of a systemic banking crisis affecting the aggregate amount of foreign direct investment invested. However, their findings indicate a reduction in the number of investment projects undertaken by foreign firms due to financial constraints. Considering aggregate foreign direct investment was unaffected, they conclude the decline in total foreign direct investment volumes evidenced during the global financial crisis might be broadly explained by the decline in world GDP rather than the financial constraints.

Dabla-Norris et al. (2010) examine macroeconomic developments in G7 source countries as external determinants for outward bilateral foreign direct investment to developing countries between 1985 and 2007. They assert a significant share of foreign operations related to foreign direct investment are supported through financing obtained from international capital markets. Thus, borrowing costs will be responsive to changes in global interest rates. They find during the period prior to the global financial crisis, excess global liquidity and lower cost of finance proxied by the real interest rates in industrialised countries, was associated with greater outward foreign direct investment to low income countries. Whereas, economic activity proxied by growth of real GDP and the output cycle in source countries is strongly and significantly linked with more outward foreign direct investment to low income countries. In addition to these cyclical factors determining foreign direct investment, they provide evidence of lower outward foreign direct investment from advanced countries during periods through which they were experiencing recessions.

Klein et al. (2002) use the natural experiment of financial distress of Japanese banks in the 1990s to examine outward foreign direct investment to USA. They explore the role of imperfect capital markets and credit constraints on firms reliant on external bank finance. They put forward the *'relative access to credit hypothesis'* which infers the capacity of firms to engage in foreign investment abroad is reliant on their access to external finance. Since many firms in Japan depend on banks for debt finance, the readiness of banks to offer credit fell following the weakening financial conditions experienced by local banks. Klein et al. (2002) conclude decline in outward foreign direct investment from Japan to USA was on account of diminishing financial sector conditions which resulted in lesser credit provided to firms in Japan by financial intermediaries, restraining the capacity of firms to undertake foreign direct investment abroad. Therefore, the availability of external finance varies with the condition of the financial sector particularly for firms highly reliant on bank finance for outward

investment.

Desbordes and Wei (2016) analyse the causal effects of financial constraints on outward greenfield foreign direct investment during 2003-2010 from 99 source countries to 135 host countries. They identify the influence of restricted financial conditions on multinational firms operating in 13 broad manufacturing sectors during the 2008-2010 global financial crisis using a difference in difference methodology. Considering most investor countries were from the OECD, facilitates the identification of countries which experienced banking crisis during 2008-2010 using the crisis database of Laeven and Valencia (2013). They find evidence the global financial crisis led to an overall decline in the magnitude of outward greenfield foreign direct investment, in sectors more dependent on external finance in countries with well-developed financial sectors. However, this adverse effect was particularly greater in countries which also suffered from a banking crisis.

Stoddard and Noy (2015) using a sample of emerging market and developing countries investigate the effects of different types of crises on foreign direct investment inflows. They find banking, inflation, hyperinflation and external debt crises have a negative impact on foreign direct investment. They further isolate foreign direct investment by type and find similar adverse effects of these various crises on greenfield foreign direct investment, mergers and acquisitions, horizontal foreign direct investment and vertical foreign direct investment. However, the analysis is unable to find evidence of a rise in foreign direct investment inflows following crisis episodes given the predictions of the fire sale foreign direct investment hypothesis of Krugman (2000).

## 2.3 Empirical methodology

### 2.3.1 Empirical specification

To ascertain the impact of financial conditions on outward bilateral foreign direct investment, this chapter examines financial sector development in both the source and host country. Gravity models are often used to explain flows between countries and have performed well empirically. Prior studies of equity flows (Portes and Rey, 2005a), foreign direct investment (Loungani et al., 2002), foreign portfolio investment (Hattari and Rajan, 2011), and international mergers and acquisitions(Di Giovanni, 2005; Coeurdacier et al., 2009; Head and Ries, 2008) have used the gravity model. The gravity model allows for the assessment of both source and host country determinants

of foreign direct investment levels. The traditional or intuitive gravity model uses the concept of Newton's law of gravitational force. Economic flows will vary proportionally with the mass of economic activity in the source and host country and inversely with the distance between the source and host country. Application of this concept yields the following:

$$X_{ij} = \frac{M_i M_j}{D_{ij}} \tag{2.1}$$

The basic gravity model relates economic flows $X_{ij}$, positively to source $M_i$ and host $M_j$ countries incomes and inversely to the distance between them $D_{ij}$. However, Anderson and Wincoop (2003) highlight the standard gravity equation above has the imperfection of omitting multilateral resistance factors. Resistance factors include capital controls, information costs, trade or monetary agreements, languages, differences in business practices, taxes, bilateral or multilateral agreements. The theoretically consistent gravity model accounts for the elasticity of substitution of traded goods(relative trade costs between trading partners) and all the bilateral trade costs between home and recipient countries. These bilateral trade costs will vary for each country-pair and will be different over time. In equilibrium, bilateral trade depends on the relative prices of importing and exporting countries which in turn are reliant on other trade barriers or multilateral resistance of other countries,(Anderson and Wincoop, 2003).

The exclusion of multilateral resistance terms (MRTs) creates a bias which necessitates the introduction of fixed effects to encompasses the various unobservable effects that might affect the relationship between two countries (country-pairs). Thus, in order to estimate the theoretically consistent gravity equation, it is suggested to use source-year and host-year fixed effects consider the country (source and host) characteristics. The existence of multilateral resistance means there is need to account for heteroscedasticity. Apart from bilateral costs affecting trade between countries, trade costs of each country with all others also matters. The theoretically consistent gravity model accounts for these multilateral resistance terms. Following from Anderson and Wincoop (2003) and Head et al. (2010) the theoretically consistent gravity model can be specified as follows for the value of $X_{ijt}$, the foreign direct investment originating from source country $i$ to host country $j$ in year $t$:

$$X_{ijt} = G_t M_{it} M_{jt} \theta_{ijt} \tag{2.2}$$

In equation 2.2, $M_{it}$ and $M_{jt}$ denote features of source and host countries in a particular year $t$, with $G_t$ representing mutual year-specific dynamics determining foreign direct investment. Disparities in the intensity of bilateral foreign direct investment

arise through $\theta_{ijt}$. Therefore, $M_{it}$ and $M_{jt}$ are the monadic effects and $\theta_{ijt}$ is the dyadic (country-pair) effects. This is comprised of factors affecting costs between bilateral partners (Head et al., 2010). Here, $\theta_{ijt}$ in equation 2.2 includes observed $D_{ijt}$ and unobserved $\varepsilon_{ijt}$ bilateral determinants respectively as follows:

$$\theta_{ijt} = \lambda D_{ijt} + \varepsilon_{ijt} \tag{2.3}$$

Following Head et al. (2010), the traditional approach is to take the log of equation 2.2 to obtain a linear combination of factors that affect foreign direct investment between source country $i$ and recipient country $j$. Taking the log of the simplistic gravity equation 2.2 yields:

$$lnX_{ijt} = lnG_t + lnM_{it} + lnM_{jt} + ln\theta_{ijt} \tag{2.4}$$

Firms undertaking foreign direct investment activity encounter hefty upfront expenditures and are usually constrained in their ability of dealing with these costs solely using internal financing with some sectors being more reliant on external finance than others,(Desbordes and Wei, 2014). Financial institutions have an effect on the activities of foreign firms since they support firms with external finance to back their fixed costs,(Bilir et al., 2014). This suggests some firms will be reliant on external finance to participate in foreign investment to either purchase new or existing assets abroad. Thus, the need to carry out investment surpasses internally generated cash flows which may arise due to lengthy gestation period, scale of project, short harvest period or necessity for continuing investment, (Rajan and Zingales, 1998). Therefore, higher investment activities abroad will depend on the firm's ability to acquire external finance which is related to the level of financial development. The capacity of these firms to expand into external markets will rely on financial sector development. Access to external finance is influenced by financial sector development and therefore a well-functioning financial system in the source country will result in greater outward foreign direct investment. Therefore, the first hypothesis of the analysis is as follows:

**Hypothesis One**: Source country financial sector conditions influence the decision of multinational corporations to invest abroad. The impact of more financial development in source countries is expected to lead to greater outward foreign direct investment.

By allowing greater financial access for local firms, financial development will stimulate diversity in the production of intermediate inputs available in the domestic market,

(Alfaro et al., 2010). This can stimulate outward foreign direct investment if foreign firms can rely on these domestic inputs in the host country for production. Conversely, host country financial sector development, through enabling the growth of domestic market size will promote market seeking foreign direct investment (Desbordes and Wei, 2014).

**Hypothesis two**: Well-developed financial sector in the host country results in greater inward foreign direct investment from abroad.

However, host country financial sector development is anticipated to generate ambiguous effects for foreign direct investment, (Desbordes and Wei, 2014). Since financial constraints in the host country would first affect domestic firms rather than external firms. A well-developed financial sector in the host country will result in better access to finance for credit constrained local firms enabling their expansion and entry, shrinking the market size and generating greater competition for multinational corporations adversely affecting its appeal as a destination for horizontal foreign direct investment, (Bilir et al., 2014).

The specification of a theoretically consistent gravity model requires the inclusion of MRTs as well as factors that encourage foreign direct investment. The basic gravity model consists of outward bilateral cross border investment as a function of the size of the home and host economies and distance. An augmented gravity model inclusive of other economic and financial variables relating to costs of undertaking foreign direct investment will be used to test these hypotheses. This will allow isolation of how financial development determines foreign direct investment independent of conventional gravity variables. The specification used follows Di Giovanni (2005) on the role of financial deepening in the source country as a driver for mergers and acquisitions and extends the work of Desbordes and Wei (2014). Unlike Donaubauer et al. (2016), this analysis does not use a composite index for financial development. Rather it considers financial development in debt and equity markets along with institutional based measure of financial contracting. It considers the dual effect of financial sector development in source and host countries as a driver for foreign direct investment and includes additional determinants for foreign direct investment. The specification is as follows:

$$FDI_{ijt} = \beta_1 lnGDP_{it} + \beta_2 lnGDP_{jt} + \beta_3 lnDist_{ij} + \beta_4 lnFD_{it} + \beta_5 lnFD_{jt} + \beta_6 lnTrade_{ijt} + \beta_7 X_{ijt} + \mu_i + \mu_j + \mu_t + \varepsilon_{ijt} \quad (2.5)$$

The equation 2.4 is incorporated in the empirical specification in equation 2.5 by considering how source and host country factors that affect bilateral investment costs between country $i$ and country $j$. The equation is a variant of the gravity equation and is augmented with financial development and other factors to investigate the two hypotheses.

In equation 2.5, $FDI_{ijt}$ is outward bilateral foreign direct investment value in dollars flowing from source country $i$ to host country $j$. Following prior literature (Blonigen and Piger, 2014; Head and Ries, 2008; Head et al., 2010) controls for source and host country as well as country-pair variables are included. $GDP_{it}$ and $GDP_{jt}$ are GDP per capita levels of source country $i$ and host country $j$ in time $t$. GDP represents income for source and destination countries, the prospective productivity and purchasing power of consumers. Its effects on foreign direct investment are anticipated to be ambiguous. Source country GDP is anticipated to have a beneficial effect since source economies with high incomes have greater ability and tend to participate in more foreign investment activities. Conversely, lower GDP would signify constricted domestic markets which would induce firms to expand abroad to new markets,(Hattari and Rajan, 2009). A smaller home market with constrained prospects for profitability may propel firms to venture into new markets,(Jongwanich et al., 2013). Therefore, the magnitude and vicinity of potential markets can be seen as crucial elements in the choice for source countries to undertake foreign direct investment or trade in individual host countries.

However, some firms will purchase assets or set up in countries which are not well-developed to take advantage of factor price differentials such as wages; this could generate a negative relationship between host country GDP and cross border investment activity,(Stone and Jeon, 2000). Alternatively a positive outcome would imply large host countries tend to attract more investment since there are more targets for acquisition available in the case of mergers and acquisitions (Dailami et al., 2012) or potential demand from customers, (Bénassy-Quéré et al., 2007). Therefore, with market seeking foreign direct investment the coefficient of the source GDP would be expected to be positive. However, when foreign direct investment is vertical, firms expand abroad with the motivation to reduce cost; it is anticipated for host country GDP to have a negative effect on foreign direct investment.

**Investment Costs:** $Dist_{ij}$ refers to the geographical distance between country $i$ and country $j$. It captures the various time invariant bilateral characteristics related to transaction costs, (Portes and Rey, 2005a). The anticipated sign for this variable is reliant on the motive of foreign direct investment. Distance may act as a deterrent for undertaking investment abroad due to the cost of monitoring and operating in an

external market. The associated transactions costs are likely to be greater the more distant firm operations are.

However, although distance is often used as a proxy for information and transaction costs it does not adequately account for these costs,(Aggarwal et al., 2012). This in part relates to the missing trade problem where trade volumes are lower than anticipated and the home bias puzzle where the holdings of investors in foreign assets is limited despite the option for diversification. This implies there are other costs which are improperly encapsulated by the distance variable. This has resulted in the extension of the gravity model to include other factors pertaining to investment treaties, property rights, institutions, political risks,(Aggarwal et al., 2012) .

Differentials in culture between countries related to information costs such as language, common colonial ties may generate information asymmetries and other additional contracting costs which may be anticipated to exacerbate the ease of doing business,(Di Giovanni, 2005). Hence, cultural distance can yield a negative effect on foreign direct investment with greater disparity in business practices and operating environments between country-pairs. Divergent from Donaubauer et al. (2016), who use country-pair and time effects only, bilateral time invariant variables pertaining to similarities between country-pairs of common language contiguity and colonial ties are directly included in 2.5. Hence, the analysis also includes dummy variables equal to one if country-pairs share; a common language, border or historical colonial ties and equal to zero otherwise, from Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). Sharing a common border may also inform the existence of vertical or horizontal foreign direct investment. A positive effect may signify the beneficial effects of proximity as it lowers the investment costs for re-exporting, while a negative effect would signify that foreign direct investment is horizontal, (Chenaf-Nicet and Rougier, 2016).

Increasing bilateral distance between two countries will capture explicit trade costs associated with shipping and transportation as well as implicit transaction costs associated with the inadequate knowledge or inability to acquire superior quality information by the investor about the host country (Loungani et al., 2002; Dailami et al., 2012). Alternatively, distance can exert a detrimental effect for foreign direct investment between countries and acts as a barrier for the interface between country-pairs. Information costs are likely to be greater the further apart countries are. For more distant countries, cultural difference may be greater making the ease of doing business more difficult. Concurrently, the closer the source country is to the host country, the richer the information firms tend to possess regarding the financial, legal and political environments of their prospective market, making it less costlier to undertake invest

abroad, (Dailami et al., 2012).

**Financial Development:** $FD_{it}$ and $FD_{jt}$ are financial development in source country $i$ and host country $j$ in time $t$. Domestic credit to the private sector to GDP captures the total credit provided to the private sector by banks and other financial institutions. The analysis uses measures of financial depth as deep financial systems offer firms entry into the capital market to obtain external finance to support business activities.

Since firms encounter varied restrictions in sourcing financing across countries, financial constraints encountered by firms are characterised by focusing on the disparities in financial institutions across countries. Information asymmetry and moral hazard impact the capacity of managers to source funds externally from investors. Moreover, the protection of investor rights is different in countries which may generate differential outcomes for the attainability of capital. Thus, most studies use an ancillary measure of financial constraints and imperfect capital markets, in particular, the level of financial development. The rationale is to draw inference on how expanding access to credit at a country level can enhance foreign direct investment. The financial environment in which firms operate will affect firm operations on two fronts. The financing options available (debt or equity) and the relative accessibility to external finance. Most literature tends to use the indirect measures of financial constraints using outcome-based measures on debt and equity financing. These account for the amount of credit available in the economy and the capacity of institutions to aid financial contractibility, (Foley and Manova, 2015).

**Trade:** $Trade_{ijt}$ represents the bilateral trade costs between source and host country. This is obtained from ESCAP-World Bank trade cost database. These include estimated total international trade costs between each country-pair calculated using bilateral trade and GDP. It is anticipated trade costs will affect foreign direct investment ambiguously; as no consensus exists on whether trade and foreign direct investment are complements or substitutes as both offer alternate methods of accessing markets abroad, (Hattari and Rajan, 2009). Pre-existing trade relations between countries implies lower transaction costs, which serves to facilitate foreign investment activity, (Dailami et al., 2012). Markusen and Maskus (2002) highlight the motive to engage in vertical foreign direct investment is to take advantage of factor price differentials. Vertical foreign direct investment considers production costs vary in countries and therefore foreign firms will chose to locate according to relative gains of countries in a particular phase of production. The aim is how best to serve the domestic market at home taking advantage of lower production costs in host countries. The firm therefore faces the compromise of benefiting from low cost production against trade costs to export goods

back to source countries or other third countries. The firm will engage in foreign direct investment if the cost of producing abroad counters the trade costs entailed to export the goods. Lower trade costs would encourage vertical foreign direct investment or outsourcing/off shoring production abroad to various host countries. Horizontal foreign direct investment refers to where increasing returns and imperfect competition along with transport costs lead to foreign firms establishing entities abroad in order to move closer to clients and obtain local market share, (Bénassy-Quéré et al., 2007). As an alternative to exporting, entering into foreign markets through the establishment of subsidiaries will entail trading off closeness to the market with cost of production at home, (Markusen and Maskus, 2002).

**Host Country Conditions:** $X_{ijt}$ , consists of other variables which influence foreign direct investment. These include several host country county conditions including corporate tax, infrastructure and institutions.

**Corporate Taxes:** Corporate tax represents the average corporate tax in the host country. Corporate tax is a significant factor for foreign direct investment as it unambiguously impacts the earnings of foreign firms with investments in the host country and therefore reducing corporate tax rates is important for foreign direct investment to emerging market economies (Arbatli, 2011). The levels of corporate taxes can affect the inducements of firms to invest in host countries. Consequently, countries with lesser corporate tax would be more appealing for investment from form foreign firms,(Di Giovanni, 2005). Data are obtained from KPMG corporate tax survey and augmented with data from Ernst and Young Worldwide Corporate tax guide.

**Infrastructure:** Infrastructure is comprised of the sum of fixed-line telephone and mobile subscribers per 1,000 from World Development Indicators (WDI). This is used to account for the level of infrastructure in the host country. Good infrastructure is essential in drawing foreign direct investment to countries (Asiedu, 2002; Kinda, 2010). Institutional quality and political environment in the host country is an important determinant of foreign direct investment. Alfaro et al. (2008) provide evidence against the Lucas Paradox (Lucas, 1990) and illustrate how capital does not go to poor countries as anticipated in the neoclassical theory owing to paucity in host county institutions. Wei (2000) concurs, corruption may act as a deterrent for investment.

**Institutions:** institutional quality takes the indicator of regulatory quality from the World Bank Governance Indicators. Institutions potentially promote productivity expectations and offer good governance structures which offset costs relating to corruption, insecurity of investor rights, government inefficiencies and would encourage more foreign direct investment, (Bénassy-Quéré et al., 2007). The huge upfront

costs entailed in foreign investment necessitate the need for stability and enforceability of contracts. This implies government stability and property rights protection are essential, (Aleksynska and Havrylchyk, 2013).

In the theoretically consistent gravity model in equation 2.2, $\theta_i jt$ are country-pair (dyad) effects comprised of observed and unobserved influences on foreign direct investment. In the model, two types of observed influences are controlled for, time invariant and time variant controls. Time invariant controls encompassing distance between countries, contiguity, common language and common legal origins (colony). Nevertheless, the unobserved factors will culminate in the error term creating a bias. To control for these unobserved influences, a second estimation is carried out using country-pair fixed effects. This implies all time invariant variables (cultural, geographical, and historical) will be perfectly collinear and excluded. $\mu_i$ are source countries effects, $\mu_j$ are host countries fixed effects and $\mu_t$ represent the time fixed effects and finally $\varepsilon_{ijt}$ is the error term. The host and source country fixed effects in the estimations are included to eliminate the cross section and time series correlation arising from omitted variable bias,(Aleksynska and Havrylchyk, 2013). Therefore, like similar studies estimating a gravity model for foreign direct investment, time, source and host fixed effects have been included to account for the multilateral resistance factors, (Anderson and Wincoop, 2003). On the other hand, time effects are included to account for rising foreign direct investment over time owing to the rise in financial integration across countries,(Coeurdacier et al., 2009).

### 2.3.2 Outward foreign direct investment and financial crises

This section considers the considers the impact of financial crises on multinational corporations' activities. Shocks to the supply of credit are anticipated to have a detrimental effect on outward bilateral foreign direct investment. To test this hypothesis, the estimated model is as follows:

$$FDI_{ijt} = \beta_1 lnGDP_{it} + \beta_2 lnGDP_{jt} + \beta_3 lnDist_{ij} + \beta_4 lnFD_{it} + \beta_5 lnFD_{jt} + \beta_6 lnTrade_{ijt} + \beta_7 X_{ijt} + \beta_8 GFC_t + \mu_i + \mu_j + \mu_t + \varepsilon_{ijt} \quad (2.6)$$

The global financial crisis, $GFC_t$ is encapsulated by a dummy variable and takes the value of 1 for the period between 2008-2010 and 0 otherwise. The global financial crisis resulted in many countries experiencing banking crisis, with advanced and emerging economies suffering greater output loses compared to developing countries, (Laeven and Valencia, 2013). Laeven and Valencia (2013) assert that these output

losses were largely instigated by banking crises. This makes banking crises very disruptive, (Kroszner et al., 2007). The analysis further investigates the credit channel effect of the global financial crisis by focusing on country specific deterioration in credit conditions similar to (Desbordes and Wei, 2016). The severity of the global financial crisis was varied across countries, with some countries subsequently experiencing systemic banking crises. This credit channel effect may have a varied effect on outward foreign direct investment depending on whether source or host countries experienced systemic banking crises. To test this hypothesis, countries adversely impacted by systemic banking crises are identified using the systemic crisis database of Laeven and Valencia (2013). They identify a banking crisis based on two factors. First, when there are considerable indications of financial distress in the banking system. This entails bank runs, bank losses or bank liquidations. Second, when policy intervention operations take place in reaction to considerable losses within the banking system. Therefore, a country specific dummy variable $SYS$ equal to 1 is created for when the source country had a systemic crisis and 0 otherwise. A similar variable is created for the host country.

$$FDI_{ijt} = \beta_1 lnGDP_{it} + \beta_2 lnGDP_{jt} + \beta_3 lnDist_{ij} + \beta_4 lnFD_{it} + \beta_5 lnFD_{jt} + \beta_6 lnTrade_{ijt} + \beta_7 X_{ijt} + \beta_8 SYS_{it} + \beta_9 SYS_{jt} + \mu_i + \mu_j + \mu_t + \varepsilon_{ijt} \quad (2.7)$$

Systemic banking crises are anticipated to adversely impact the level of country incomes and generate demand shocks or through financial constraints by lowering the amount of credit available, (Gil-Pareja et al., 2013).

### 2.3.3 Estimation approach and data

According to Razin and Sadka (2007), the fixed costs associated with foreign direct investment create two margins, the extensive margin of whether to enter a new market or alternatively the decision to embark on investment or not; the intensive margin regarding the magnitude of foreign direct investment or how much to invest. The values registered as zero in the data set will therefore either represent actual zero entries or the consequence of activity that falls below a threshold above zero. Similarly, missing observations within the may correctly or incorrectly represent actual zeros, (Anderson, 2011). This results in many zeros and missing values in the actual observed foreign direct investment flows between country-pairs. Furthermore, not all country-pairs will have investment relations. Given n sample countries, there are supposed to be n(n-1) country-pairs but observed bilateral data is usually lower. Therefore, this makes the selection of actual country-pairs endogenous, (Razin and Sadka, 2007).

The choice of the appropriate estimation approach will depend on the presumptive reason for the zero entries. Anderson (2011) advances the occurrence of zero entries in the data as zeros representing very minimal flows as a consequence of reporting practices or zeros representing the selection decision for the firm. Anderson (2011) highlights that zeros may reflect meaningful selection by multinational corporations. Since firms incur fixed costs to entering new markets and only the most productive firms in source country $i$ can manage to cover these fixed costs to entering new markets abroad in country $j$. When entry into a host country $j$ is too costly, no firms in source country $i$ can afford to cover the fixed cost. This generates zeros in the country-pair data.

Several corrective measures have been proposed to account for the incidence of zero entries in the dependent variables for bilateral country-pair data. Firstly, truncation, this entails simply discarding from the sample all country-pair observations with zero entries. This is valid if zero entries represent random missing data or rounding errors, (Head and Mayer, 2014). On this basis, these entries offer no information and consequently are not useful. It is valid to eliminate these zeros because they are of no economic significance relative to the non-zeros, (Anderson, 2011). Estimation of the log linear specification of the gravity model using OLS may produce inconsistent results. Given the log of zero is undefined and most of the country-pairs tend to have missing data, using a log linear specification decreases the sample size by omitting the zeros, hence generating a selection bias,(Head and Mayer, 2014). The sample estimated is not randomly selected from the population and will comprise exclusively of country-pairs with positive foreign direct investment stock entries. Therefore, truncation introduces bias in the least squares' estimation approach, (Westerlund and Wilhelmsson, 2011). Furthermore, Silva and Tenreyro (2006) provide evidence that the estimation of the gravity model in logs produces inconsistent estimates in the presence of heteroskedasticity.

Conversely, if these entries were erroneously registered as zeros, the incidence of large number of zero observations in the data might yield biased estimation results (Head et al., 2010). Should these entries denote actual zero foreign direct investment data or errors arising from rounding due to very limited volumes of foreign direct investment activity, their omission will result in the exclusion of information which could generate inconsistent results. For instance, these values might reflect unobserved costs such as exorbitant transportation costs on account of distance between country-pairs or related to the country remoteness or limited size of the market (Head and Mayer, 2014). Similarly, Guo and Pan (2015) highlight the omission of the observations with zero entries disregards the extensive margin and the impact of fixed costs.

Alternatively, the addition of one or a small constant to entries of foreign direct investment prior to taking the log of FDI to prevent the exclusion of zero observations has been suggested. However, this method is considered ad hoc and might not be a true depiction of the actual values and is prone to providing results which are inconsistent, (Head and Mayer, 2014). Tobit estimators presume the existence of zeros is due to measurement error, where investment transactions are not recorded. All foreign direct investment below a certain level are not recorded because of measurement error. Although a valid explanation for the incidence of zero observations, it may be seen as incomplete and biased as it does not preclude the fact some country-pairs do indeed have no bilateral transactions in a given year, (Coeurdacier et al., 2009). This approach entails left censoring observations at zero or some minimum positive value, these censored observations are accounted for as zeros. Silva and Tenreyro (2006) corroborate the inappropriateness of Log-linear and Tobit models as they produce inconsistent estimates with the existence of heteroscedasticity.

The Heckman Selection model is often used as a solution to the shortcomings of OLS and Tobit estimators and as an alternate to dealing with the zeros to facilitate the inclusion of all country-pair information. It accounts for both measurement error and initial costs as factors giving rise to zeros recorded for country-pairs. It considers foreign direct investment as a two-step process, the investment decision (selection equation) and the magnitude of investment(outcome equation). This considers the selection decision for foreign direct investment and has been used by Helpman et al. (2008). The outcome equation describes the relationship between foreign direct investment and selected determinants. While, the selection equation entails an augmented model that explores the link between positive foreign direct investment, the prior group of independent variables and a supplementary variable which serves as an instrument. To meet the exclusion restriction, the additional variable must be related to the likelihood of country-pairs engaging in foreign direct investment but not the volume of foreign direct investment. The drawback of this methodology is the difficulty in the choice of appropriate instruments for the selection equation that meets the exclusion restriction,(Anderson, 2011).

The third alternative is to estimate the model in levels using an alternate estimation technique. Estimating the gravity model using logs leads to inconsistent estimates. With a lot of zeros in the data the disturbance term has a substantial mass at very small values which violates the normality assumption, (Anderson, 2011). The Poisson pseudo maximum likelihood (PPML) estimator by Silva and Tenreyro (2006) is the most appropriate and efficient methodological technique to use. It can be used on the levels of foreign direct investment and provides estimates for the non-linear gravity model and prevents the discarding of zero foreign direct investment entries. Modelling

the disturbance term as generated by the Poisson is considered better and will result in smaller estimates compared to OLS. This approach considers zero observations in the dependent variable and is scale invariant. With heteroscedasticity, the PPML achieves consistent estimates than OLS regardless of the distribution of the data where estimating a log-linearised model with OLS would discard zeros from the model and create a sample selection bias; (Silva and Tenreyro, 2006).

Considering not all country-pairs have data reported in a given year. The dataset used in the analysis is comprised of a significant amount of zero observations. While both Heckman and Poisson approaches have the preferred properties of retaining zeros in the dependent variable, through simulations Head and Mayer (2014) show that the Poisson estimator by Silva and Tenreyro (2006) is the best approach for handling zeros. Therefore, the analysis uses the Poisson approach to estimate the gravity model following Coeurdacier et al. (2009) and Donaubauer et al. (2016) to analyse multinational investment activities in emerging market and developing economies. This is a more suitable approach because it is robust to different patterns of heteroscedasticity and allows for the inclusion of a large number of zeros in the dependent variable. It further addresses potential measurement errors and firm heterogeneity in selecting to engage in investment activities abroad.

### 2.3.4 Data and summary statistics

#### Bilateral foreign direct investment data

This analysis uses a panel dataset on bilateral outward foreign direct investment(greenfield and mergers and acquisitions) stocks from 43 source countries (advanced and emerging) to 116 host countries (emerging and developing). The data cover the period of 2001 to 2012, which also includes the period of the global financial crisis. The data is extracted from the United Nations Conference on Trade and Development (UNCTAD) owing to the greater coverage of bilateral flows for emerging market countries. Source countries of outward foreign direct investment include investors from the North(industrialised and emerging)and the global South (emerging and developing countries). The selection of countries and the time period are solely based on availability of bilateral foreign direct investment data sourced from UNCTAD. The bilateral data used reflects both aggregate greenfield and mergers and acquisitions foreign direct investment contrary to Desbordes and Wei (2017)who use greenfield and mergers and acquisitions bilateral foreign direct investment data in the manufacturing sector.

The panel has an unbalanced structure with a large proportion of the sampled country-pairs consisting of zero foreign direct investment values. From a total of 17,558 observations, 29% of the foreign direct investment stock observations are zero. This may imply that not all countries were recipients of investments in some years. Table 2.1 presents the summary statistics for the main variables used in the empirical analysis.

Table 2.1: Summary Statistics

| Variable | Mean | Min | Max | Standard Deviation | Observations |
|---|---|---|---|---|---|
| FDI | 1222.03 | 0.00 | 138603.00 | 5053.28 | 17558 |
| ln(FDI) | 4.93 | -0.71 | 11.84 | 2.59 | 12533 |
| ln GDP $_{\text{Source}}$ | 11.08 | 3.02 | 14.30 | 1.76 | 20387 |
| ln GDP $_{\text{Host}}$ | 5.98 | -0.88 | 13.65 | 3.93 | 20213 |
| ln Distance | 8.55 | 4.71 | 9.88 | 0.82 | 20111 |
| Common Border | 0.05 | 0.00 | 1.00 | 0.23 | 20111 |
| Common Language | 0.14 | 0.00 | 1.00 | 0.35 | 20111 |
| Colonial Links | 0.04 | 0.00 | 1.00 | 0.20 | 20111 |
| $\text{Credit}_{\text{Source}}$ | 94.84 | 5.38 | 212.90 | 48.81 | 19667 |
| $\text{Credit}_{\text{Host}}$ | 39.72 | 0.55 | 150.21 | 32.23 | 19905 |
| ln Trade | 5.05 | 2.42 | 7.26 | 0.44 | 18409 |
| ln Tax | -1.33 | -2.41 | -0.60 | 0.33 | 18031 |
| Infrastructure | 3.85 | -2.00 | 5.47 | 1.21 | 19958 |
| Institutions | -0.17 | -2.34 | 1.96 | 0.73 | 18662 |
| Credit $\text{indx}_{\text{Source}}$ | 4.63 | 0.00 | 6.00 | 1.38 | 13512 |
| Credit $\text{indx}_{\text{Host}}$ | 2.81 | 0.00 | 6.00 | 2.47 | 13183 |
| Legal $\text{rights}_{\text{Source}}$ | 6.13 | 2.00 | 10.00 | 2.13 | 13512 |
| Legal $\text{rights}_{\text{Host}}$ | 5.19 | 0.00 | 10.00 | 2.36 | 13183 |
| Bond $\text{market}_{\text{Source}}$ | 42.63 | 0.00 | 197.13 | 39.29 | 17550 |
| Bond $\text{market}_{\text{Host}}$ | 17.03 | 0.00 | 71.30 | 18.85 | 6220 |
| Stock $\text{market}_{\text{Source}}$ | 71.03 | 1.16 | 265.13 | 46.28 | 20186 |
| Stock $\text{market}_{\text{Host}}$ | 47.00 | 0.01 | 996.94 | 58.64 | 15080 |

Zero foreign direct investment entries may be on account of errors in rounding diminutive volumes of foreign direct investment, missing entries erroneously registered as zeros or the outcome of firm decision not to engage in any outward foreign direct investment activity. Given the likelihood missing values are either not reported foreign direct investment (non-zeros) and taking unreported foreign direct investment as zero might lead to biases, (Head et al., 2010). The analysis therefore handles missing values as missing. Furthermore, negative bilateral foreign direct investment entries signify no foreign investments occurred between a given source and host country-pair, rendering it practical to handle negative values as zero. Observations with either zero or negative bilateral foreign direct investment values are considered as zero. Therefore, the dependent variable is either zero or positive, with negative observations of foreign direct investment assigned a value of zero similar to Donaubauer et al. (2016).

The measure of aggregate multinational corporation activity is foreign direct investment stock rather than foreign direct investment flows. Foreign direct investment

stock is used as the dependent variable because it represents the total value of assets of the foreign investor. It is reflective of the assets involved in international production, (Stephan and Pfaffmann, 2001). Daude and Stein (2007) use stocks to represent the activity of multinational corporations and advance capital stock as a better measure of multinational corporation's investment activity than investment flows. On the other hand, foreign direct investment flows account for the amount invested in affiliates by foreign firms, therefore foreign direct investment stock is better suited to accurately measure the long run effects. Compared to foreign direct investment flows, foreign direct investment stock adequately captures the activities of multinational corporations, (Wacker, 2016).

Credit constraints play an important role in the type of investments firms can pursue, with some ventures or sectors being more reliant on finance than others. Prior literature has used the difference in difference approach to identify sectoral level reliance on external financing and the heterogeneous development of capital markets across countries. Manova (2013), uncovers the relationship between trade and finance and is similarly, adopted in the context of the causal effects of financial development and foreign direct investment by (Desbordes and Wei, 2017). These studies exploit sectoral data on external dependence and asset tangibility and variations in country level financial development. This is an improvement from simply looking at the level effect of financial development which may be subject to bias, where the influence of reverse causality could be greater,(Foley and Manova, 2015).

In the empirical analysis credit provided to the private sector by banks and other financial institutions to GDP is used as a proxy for firm external financing. The analysis will examine the impact of tightening credit conditions following the global financial crisis and country specific systemic banking crisis similar to Desbordes and Wei (2016). This will be done by incorporating the credit conditions in both origin and destination countries similar to Donaubauer et al. (2016) and Desbordes and Wei (2017). However, the latter uses firm level sector specific greenfield foreign direct investment data over a shorter period.[4] This analysis uses outward aggregate foreign direct investment data obtained from the UNCTAD database which is publicly available as an alternative. This is similar data used by Donaubauer et al. (2016) and covers a wider time frame and includes mergers and acquisitions, and not only initial investments. Donaubauer et al. (2016) use a parsimonious gravity model estimated with solely country-pair fixed effects to account for all bilateral time invariant attributes between partner countries. This analysis uses an augmented gravity model explicitly including time invariant vari-

[4]Desbordes and Wei (2017) use foreign direct investment data based on firm level greenfield investment for obtained from the Financial Times Limited Cross Border Investment Monitor database. Available at: https://www.fdimarkets.com/

ables along with both vertical and horizontal determinants of foreign direct investment. Therefore, this analysis takes a country level perspective rather than firm level due to the nature of the data available.

### Financial development

Financial sector development variables are from the World Bank Global Financial database. The main conventional measures of debt and equity financing of the firm in the literature are based on financial depth or the extent of financial deepening of debt and equity markets. Given firms differential access to financing, the analysis uses the firm fund-raising practices as encapsulated by two types of contracts, debt and equity financing. The debt market is considered using a proxy for access to loans as well as corporate bond financing. The availability of equity capital is captured by measures of the stock market. The depth of debt and equity markets are time varying and data is collected for a large sample of countries, (Beck et al., 2009; Cihak et al., 2012). The caveat is they consider both the supply of external and the demand by firms for external capital, Foley and Manova (2015). The inclusion of both debt and equity financing contracts permits the consideration of the impact of these alternative financing arrangements on outward bilateral foreign direct investment. The provision of credit by banks has often been viewed as vital for channelling resources to borrowers, nonetheless financial development in equity and debt markets have also become important alternative sources of funds particularly for foreign investment such as mergers and acquisitions, (Jongwanich et al., 2013). Similarly, time invariant measures account for the institutional aspects governing the effectiveness or enforceability of financial contracts and may create heterogeneity in the extent of financial development across countries. These institutional based proxies of financial development will ultimately affect the relative ease with which firms can obtain external financing. Substitute measures of external finance include time invariant factors such as accounting standards, risk of repudiation, creditor rights and risk of expropriation in a given economy, (Manova, 2013). The analysis uses the strength of legal rights index and credit information index as alternate time invariant measures of external finance contracts from the World Bank Doing Business database.

## 2.4 Results

### 2.4.1 Effects of financial development on bilateral foreign direct investment

This section presents the estimates of the impact of financial conditions on the volume of foreign direct investment. Following Gil-Pareja et al. (2013), estimations are carried out using the Poisson Pseudo Maximum Likelihood (PPML), Poisson Maximum Likelihood country-pair (PPML-CP) panel estimations and OLS. Table 2.2 shows results for two alternate specifications using the log linearised model estimated by OLS and Poisson regressions on the volume of aggregate bilateral foreign direct investment. Columns (1) and (2) in table 2.2 report the results when the gravity model specifications exclude all country-pairs with foreign direct investment stock values of zero and treats all zeros in the data as actual zero entries recorded. The results for the conventional gravity model determinants, economic size, distance and the time invariant bilateral variables under the OLS regression are broadly in line with literature and have the expected signs. However, these estimations suffer from self-selection bias as the log linearised specification discards observations with zero values in the dependent variable.

Although OLS estimations have limitations, these are presented in table 2.2 in columns (1) to (2). The OLS estimates serve as a benchmark and are qualitatively similar with the estimates using the Poisson estimator. This highlights the robustness of the results to estimation methodology.[5]

Given the limitations of the prior OLS estimations, the analysis focuses on the results of the preferred Poisson estimates presented in columns (3) to (6) of table 2.2. The gravity equation performs well explaining around 83% of the variation in in bilateral investment flows. These specifications presume that zero values in the foreign direct investment data are random and arise due to high initial fixed costs or measurement errors. Following, Silva and Tenreyro (2006), the dependent variable is outward foreign direct investment stock in levels on a bilateral basis instead of logs and therefore incorporates the zero values in the data. The interpretation of coefficients in Poisson regression is similar to OLS. Albeit, while the dependent variable in the Poisson model is expressed in levels, the coefficients of regressors in logarithms can be interpreted as elasticities while regressors in levels are interpreted as semi-elasticities, (Shepard, 2012). In columns (3) and (5) of table 2.2, country fixed effects for both source and host and year fixed effects are included with errors clustered at country-

[5]The inverse hyperbolic sine transformation will be used for future publication. This is analogous to a log transformation but preserves the zeros.

pair level. This is done to remove the bias of misspecification that arises due to the exclusion of multilateral resistance terms as stipulated by (Anderson and Wincoop, 2003). This is done to remove unobserved heterogeneity that may arise from excluding variables at the country-pair level that may impact bilateral foreign direct investment. In columns (4) and (6) country-pair and year fixed effects are included. This excludes all time invariant bilateral variables.

Focusing on the baseline results in column (3), source country financial development is significantly positive with a coefficient of 0.29. While host country financial development is also significant with a coefficient of 0.19. These estimated coefficients imply that a 1% increase in the private credit to GDP ratio is associated with a 0.29% and 0.19% increases bilateral foreign direct investment for source countries and host country respectively. Better financial development in source and host countries is predicted to result in greater volume of bilateral foreign direct investment stocks. Financial deepening, an increase in credit to GDP, is associated with an increase in bilateral foreign direct investment. This suggests financial market development is an important driver of foreign direct investment with source country credit market conditions emerging with a larger impact. Aggregate outward foreign direct investment on a bilateral basis is expected to increase with greater source country financial development, if multinational corporations are able to access capital in a well-developed financial system. Inadequately developed financial markets at home may hinder the expansion of multinational corporations seeking funds to cover the fixed initial costs associated with foreign direct investment. Alternatively, lower financial development may result in a greater reliance on internal capital markets by multinational corporations seeking to support their foreign subsidiaries. Host financial development may also hinder or promote foreign direct investment between country-pairs.

In column (3), the estimates for market size and distance yield similar results to the intuitive gravity model with the exception of host country GDP. The size of the source country market is positive and significant, an increase in home GDP of percent will increase foreign direct investment by 0.17% percent. A big market within the source country may signify larger income and greater capacity to undertake investment abroad. Thus, it is anticipated outward foreign direct investment will respond positively to a large market size in the source country. Contrary to the predictions for horizontal foreign direct investment where investment is driven by market seeking motives; the host county market size effect is not a significant determinant of bilateral foreign direct investment. This could reflect the smaller market sizes for small countries included in the sample.

Coefficients for distance suggest it to be a resistance factor to foreign direct invest-

Table 2.2: Private Credit and Bilateral Foreign Direct Investment

| | ln(FDI) | ln(FDI) | FDI | FDI | FDI | FDI |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $_{\text{Source}}$ | 0.129 | 0.327** | 0.288* | 0.335** | 0.325** | 0.374** |
| | (0.435) | (0.019) | (0.063) | (0.028) | (0.043) | (0.018) |
| $\text{Credit}_{\text{Host}}$ | 0.206** | 0.310*** | 0.194** | 0.221*** | 0.188** | 0.211*** |
| | (0.042) | (0.000) | (0.011) | (0.004) | (0.014) | (0.005) |
| ln GDP $_{\text{Source}}$ | 0.100** | 0.190*** | 0.176*** | 0.158*** | 0.170*** | 0.152*** |
| | (0.029) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| ln GDP $_{\text{Host}}$ | 0.002 | 0.028* | 0.005 | 0.008 | 0.005 | 0.007 |
| | (0.933) | (0.070) | (0.744) | (0.635) | (0.764) | (0.638) |
| ln Distance | -0.811*** | | -0.362*** | | -0.362*** | |
| | (0.000) | | (0.000) | | (0.000) | |
| Common Border | 0.303 | | -0.338** | | -0.337** | |
| | (0.152) | | (0.045) | | (0.045) | |
| Common Language | 0.582*** | | 0.822*** | | 0.822*** | |
| | (0.001) | | (0.000) | | (0.000) | |
| Colonial Links | 0.666*** | | 0.245 | | 0.244 | |
| | (0.001) | | (0.180) | | (0.181) | |
| ln Trade | -1.761*** | -0.451*** | -1.544*** | -0.400*** | -1.542*** | -0.393*** |
| | (0.000) | (0.000) | (0.000) | (0.001) | (0.000) | (0.001) |
| ln Tax | -0.408*** | -0.117 | -0.723*** | -0.458*** | -0.712*** | -0.440*** |
| | (0.005) | (0.271) | (0.000) | (0.001) | (0.000) | (0.002) |
| Infrastructure | 0.011 | 0.073 | 0.308*** | 0.268*** | 0.316*** | 0.275*** |
| | (0.878) | (0.217) | (0.000) | (0.000) | (0.000) | (0.000) |
| Institutions | 0.080 | 0.043 | 0.141 | 0.195 | 0.129 | 0.182 |
| | (0.636) | (0.804) | (0.277) | (0.137) | (0.316) | (0.164) |
| GFC | -0.238*** | -0.336*** | -0.071** | -0.083*** | | |
| | (0.000) | (0.000) | (0.027) | (0.003) | | |
| $\text{Credit}_{\text{Source}} \times$ GFC | | | | | -0.123*** | -0.123*** |
| | | | | | (0.002) | (0.001) |
| $\text{Credit}_{\text{Host}} \times$ GFC | | | | | 0.028 | 0.032 |
| | | | | | (0.313) | (0.218) |
| Constant | 14.656*** | 2.478** | 7.459*** | | 6.668*** | |
| | (0.000) | (0.021) | (0.000) | | (0.000) | |
| N | 9,479 | 9,479 | 12,645 | 12,296 | 12,645 | 12,296 |
| $R^2$ | 0.69 | 0.39 | 0.83 | | 0.83 | |
| Estimator | OLS | OLS | PPML | PPML-CPFE | PPML | PPML-CPFE |
| Source FE | Yes | | Yes | | Yes | |
| Host FE | Yes | | Yes | | Yes | |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Country-Pair FE | | Yes | | Yes | | Yes |

Statistical significance denoted at 1%(***), 5% (**) and 10% (*).Robust standard errors in parentheses. Observations clustered within country-pairs

ment. The proximity between source and host country exerts a negative influence on outward foreign direct investment as it accounts for information and transaction costs. The more distant countries are the more costly it is to monitor investments abroad, (Di Giovanni, 2005). Greater distance will result in a 3.6 % reduction in outward foreign direct investment.

Focusing on the bilateral time invariant variables, countries sharing a common language are likely to have lower transaction costs, such as business search costs and lower risk perceptions of firms within the host country,(Jongwanich et al., 2013). A shared common language encourages foreign direct investment between country-pairs and may reflect its enabling role in easing the cost of doing business. In contrast, sharing a common border is associated with a 28.7% percent decline in outward foreign direct investment.[6] The negative coefficient obtained for contiguity may also suggests the nature of bilateral foreign direct investment in the sample could be horizontal and that the gains of lower transportation costs from proximity do not enhance cross border activity, (Chenaf-Nicet and Rougier, 2016). However, the insignificant coefficient obtained for host country GDP, the main driver of horizontal foreign direct investment does not confirm this. This may reflect opposing patterns of horizontal and vertical foreign direct investment in the countries in the sample. [7] Whereas the impact of colonial links on the volume of bilateral foreign direct investment is insignificant.

The association of trade costs with foreign direct investment is negative at the 1% level indicative of a substitutive relationship. Trade costs lower bilateral foreign direct investment. foreign direct investment can substitute trade when there are impediments such as transportation costs and trade barriers, (Di Giovanni, 2005). This entails a comparison between the associated costs of setting up a physical plant with trade costs which would be incurred if the firm were to export. Given a small potential host country, the fixed costs to the firm of establishing a physical plant abroad may not adequately counterbalance the savings on trade costs from not exporting. Conversely, greater host country market size and lower fixed costs are would be more conducive for horizontal foreign direct investment. The firm motive is driven by how best to serve the market abroad (host) through either physical presence or exports. If source firm seeks to assemble and export its goods from the host country to other countries, then lesser trade costs would encourage foreign direct investment. This would be conducive for investment driven by vertical foreign direct investment motives seeking to lower

[6]Note that coefficients are not solely elasticities. The impact is calculated in the form exp(-0.338)-1

[7]Following the theoretical knowledge-capital model of Kleinert and Toubal (2010) and additional determinants of vertical foreign direct investment using the difference in GDP per capita between source and host countries (skills difference) and the sum of host and source GDP (market size) to proxy the size of demand from the two countries, Chenaf-Nicet and Rougier (2016) find similar contradictory effects for types of foreign direct investment

costs. Alternatively, if the destination offers a sizeable and profitable market for source country firm products, then it would engage in foreign direct investment and establish physical presence rather than export in order to circumvent trade costs,(Frenkel et al., 2004). This would encourage market seeking, horizontal foreign direct investment into host countries.

Average host country corporate tax has a negative and significant effect on bilateral foreign direct investment. Higher corporate taxes result in 7.23% reduction in foreign direct investment. Host countries with higher taxes will inhibit foreign investment as they affect the inducements of companies to undertake economic activities. Additionally, foreign firms are inclined to enter markets where the tax rates are lower, (Coeurdacier et al., 2009). Therefore, host countries with lesser taxes will encourage more inward investment, (Di Giovanni, 2005). The availability of infrastructure in the host country is positive and statistically significant. Good infrastructure is essential in drawing foreign direct investment to countries, (Asiedu, 2002; Kinda, 2010). The regulatory quality in the host country obtains a positive coefficient that is not significant in the Poisson regressions in column (3).

To account for the effects of the global financial crisis on outward bilateral foreign direct investment, a dummy variable is introduced . The coefficient is negative and highly significant. This is in line with the outcomes of prior studies analysing the effects of the global financial crisis on foreign direct investment, (Desbordes and Wei, 2016). Outward bilateral foreign direct investment decreased due to the tightening of credit conditions and economic slowdown during the global financial crisis period, particularly outward foreign direct investment from developed countries, (Sauvant et al., 2010).

Column (4) uses the Poisson maximum likelihood country-pair fixed effects estimation. This implies that all dyadic time invariant variables are dropped from the estimation (distance, contiguity, language and colonial links). In terms of the main variable of interest, the effect of external financing conditions in both source and host countries is still positive and greater in magnitude than the previous result in column (3). When controlling for country-pair and time fixed effects, an increase in financial deepening is associated with a 0.34% and 0.2% increases bilateral foreign direct investment for source countries and host country respectively. The coefficients for other determinants maintain the expected signs and are statistically significant. While, bilateral trade costs and host country average corporate tax are deterrents of foreign direct investment. There are positive and significant effects related to infrastructure and source country income coefficients.

In column (5) and (6) the dummy variable for credit conditions in the crisis period

2008-2010 is interacted with source country and host country financial development. For source countries the coefficient for the interaction term is negative and statistically significant in both specifications. This implies that the global financial crisis reduces the effect of source financial development on foreign direct investment by 11.57%, on average.[8] This suggests that during the financial crisis, bilateral foreign direct investment benefited to a less extent from private credit in the source country. The coefficient for the host countries reflects the global financial crisis effects on host financial development had insignificant effects on foreign direct investment. Therefore, the results in table 2.2 support the hypotheses of a positive effect on the volume of foreign direct investment arising from source and host country financial development. The positive effect of source country financial development is larger than the coefficient on host financial development. Overall, the results in table 2.2 substantiate the hypotheses that both source and host financial development have a positive influence on foreign direct investment.

### 2.4.2 Systemic banking crisis effects

Table 2.3 shows the results wen country-specific credit tightening is introduced. Of the countries included in the sample, 20 source countries and 13 host countries are identified as having experienced a systemic banking crisis using the database from Laeven and Valencia (2013). A banking crisis is identified based on two aspects; when there are considerable indications of financial distress in the banking system and when policy intervention initiatives occur in reaction to considerable losses within the banking system. This is done to isolate countries that were greatly affected by the economic crisis and consequently experienced a banking crisis during the period 2008-2010. The country-specific systemic banking crisis data are used to examine the credit channel of the global financial crisis, similar to Desbordes and Wei (2016). The countries included that were affected by a systemic banking crisis is listed in table 2.8 in the appendix.

Column (1) includes the effects of local credit constraints in source and host countries, as identified from the systemic banking crisis database. For source countries, the responsiveness of outward foreign direct investment to a systemic banking crisis in the home country is negative and significant at the 1% level. This suggests when source countries experience a banking crisis, aggregate bilateral foreign direct investment is reduced by 19.1%.[9] This differs from the result obtained by Gil-Pareja et al. (2013) who examined the effects of systemic banking crises on the margins of foreign direct investment. Gil-Pareja et al. (2013) find that while a systemic banking crisis in the

[8]The impact is calculated in the form exp(-0.123)-1
[9]The impact is calculated in the form exp(-0.212)-1

source country will lower the number of new investment projects, they are unable to find similar adverse effects of a systemic banking crisis on aggregate bilateral foreign direct investment. The result in this analysis is consistent with Desbordes and Wei (2016) who find negative effects of source country systemic banking crises on greenfield foreign direct investment or initial investments in the manufacturing sector. On the other hand, the tightening of local credit conditions in host countries following a systemic banking crisis yields a positive and insignificant effect on bilateral foreign direct investment. This finding is similar to Gil-Pareja et al. (2013) who find no evidence for the effects of host country systemic crisis on total bilateral foreign direct investment. As shown in column 1, private credit is positive for both source and host countries at 1% and 5% respectively. This result is consistent with Donaubauer et al. (2016) who find a beneficial effect for aggregate bilateral foreign direct investment in both source and host countries.

Column (2) shows results for the country-pair estimations. This yields a similar negative and significant effect for source country financial constraints and divergent results from those obtained in column (1) for the host local country credit constraints. The effect of host country financial constraints on foreign direct investment is positive and significant at the 10% level. This suggests when host countries are experiencing a banking crisis, aggregate bilateral foreign direct investment increases by 13.9% on average. This could reflect the *fire sale FDI hypothesis* put forward by Krugman (2000), this notion suggests periods of crises are associated with an influx of inward foreign direct investment. Aguiar and Gopinath (2005) provide evidence that liquidity constrained firms in countries undergoing crisis tended to draw more mergers and acquisitions (M&A) foreign direct investment inflows from foreign investors during the 1997-1998 Asian crisis. Adverse local credit conditions in the host countries were accompanied by a considerable rise in acquisitions by foreign firms at cheap prices. Considering that other domestic firms will also be financially constrained, the buyers of these cheap assets are likely to be foreign. Furthermore, this effect might also reflect support for the *cheap assets' hypothesis* advanced by Baker et al. (2009), which considers multinational corporations as arbitrageurs seeking to take advantage of the differences in valuation in order to take control of cheap assets in host countries. Similarly, there may be a wealth effect which may result in more foreign direct investment inflows as it is cheaper for external investors to purchase assets in the host country following a currency depreciation. For example, Sauvant et al. (2010) highlight that not all multinational corporations may have been credit constrained during the crisis; in particular state-owned enterprises from emerging economies that were engaged in foreign direct investment. They suggest multinational corporations from economies with high foreign reserves such as China were in better condition to venture into new

markets to take advantage of low asset prices through mergers and acquisitions (M&A) in crisis-affected host countries.

With a well-developed financial system, firms are likely to benefit from greater access to external finance. The financial sector will intermediate and allocate resources more efficiently compared to an underdeveloped capital market. However, financial distress arising from a systemic banking crisis will alter the supply of credit and tighten external credit conditions. This will have implications for the amount of domestic credit available to firms, which in turn will affect multinational corporations; capacity to undertake outward foreign direct investment. To test this effect, interaction terms between the availability of domestic credit and country-specific systemic banking crisis are presented in column 3. This interaction seeks capture the relationship between the supply of external capital to firms with local credit constraints following a systemic banking crisis. Results suggest credit constraints at home reduce the effect of source country financial development on aggregate outward foreign direct investment by 31.4% on average.[10] With the deterioration of source country local credit conditions, multinational corporations will engage in less outward foreign direct investment due to lower availability of domestic credit. During the financial crisis, the potential of multinational corporations to finance the fixed costs associated with pursuing foreign direct investment abroad was restricted due to financial constraints,(Sauvant et al., 2010). This result may reflect the fact that credit constraints were intensified in source countries that experienced systemic banking crises. Therefore, a systemic banking crisis mitigates the beneficial effects of source country financial development on outward foreign direct investment. On the other hand, there is no evidence of non-linearity between systemic crisis in the host country and domestic financial development. The interaction of financial constraints in the host countries yields negative and insignificant effects. In column 4, country-pair fixed effects are controlled for, there is evidence of non-linearity between systemic crisis and financial crisis for both source and host countries. Credit constraints in the source country lower the effect of source country financial development on aggregate outward foreign direct investment by 36.9% on average. Similarly, the effects of host country credit constraints reduce the effects of host country financial development on foreign direct investment by 21.0% on average.

High income countries are likely to be exporters of capital, the estimated coefficient for source country GDP is significant in all specifications. Contrary to the predictions for market-seeking horizontal foreign direct investment, host country market size is not significant. This is similar to results in table 2.2. This may imply that for countries in the sample, foreign direct investment may not by driven by horizontal FDI motives. The estimated parameters for bilateral trade and host country conditions (tax, infras-

[10]The impact is calculated in the form exp(-0.377)-1

Table 2.3: Systemic Banking Crisis

| | FDI (1) | FDI (2) | FDI (3) | FDI (4) |
|---|---|---|---|---|
| $\text{Credit}_{\text{Source}}$ | 0.367** | 0.365** | 0.485*** | 0.518*** |
| | (0.021) | (0.018) | (0.002) | (0.000) |
| $\text{Credit}_{\text{Host}}$ | 0.234*** | 0.284*** | 0.215*** | 0.252*** |
| | (0.003) | (0.000) | (0.010) | (0.001) |
| $\text{Sys}_{\text{source}}$ | -0.212*** | -0.232*** | 1.653*** | 2.041*** |
| | (0.000) | (0.000) | (0.001) | (0.000) |
| $\text{Sys}_{\text{host}}$ | 0.123 | 0.131* | 0.333 | 0.919** |
| | (0.106) | (0.091) | (0.475) | (0.031) |
| ln GDP $_{\text{Source}}$ | 0.117*** | 0.096*** | 0.110*** | 0.088*** |
| | (0.000) | (0.002) | (0.000) | (0.002) |
| ln GDP $_{\text{Host}}$ | 0.002 | 0.003 | 0.002 | 0.005 |
| | (0.910) | (0.824) | (0.915) | (0.747) |
| ln Distance | -0.351*** | | -0.355*** | |
| | (0.000) | | (0.000) | |
| Common Border | -0.380** | | -0.372** | |
| | (0.023) | | (0.026) | |
| Common Language | 0.842*** | | 0.842*** | |
| | (0.000) | | (0.000) | |
| Colonial Links | 0.226 | | 0.226 | |
| | (0.204) | | (0.205) | |
| ln Trade | -1.620*** | -0.342*** | -1.601*** | -0.219* |
| | (0.000) | (0.008) | (0.000) | (0.083) |
| ln Tax | -0.649*** | -0.374*** | -0.620*** | -0.333** |
| | (0.000) | (0.005) | (0.000) | (0.011) |
| Infrastructure | 0.303*** | 0.241*** | 0.307*** | 0.247*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Institutions | 0.163 | 0.265* | 0.117 | 0.218* |
| | (0.230) | (0.053) | (0.365) | (0.092) |
| $\text{Credit}_{\text{Source}} \times \text{Sys}_{\text{source}}$ | | | -0.377*** | -0.460*** |
| | | | (0.000) | (0.000) |
| $\text{Credit}_{\text{Host}} \times \text{Sys}_{\text{host}}$ | | | -0.066 | -0.236* |
| | | | (0.635) | (0.069) |
| N | 11,569 | 11,152 | 11,569 | 11,152 |
| $R^2$ | 0.84 | | 0.84 | |
| Estimator | PPML | PPML-CPFE | PPML | PPML-CPFE |
| Source FE | Yes | | Yes | |
| Host FE | Yes | | Yes | |
| Time FE | Yes | Yes | Yes | Yes |
| Country-Pair FE | | Yes | | Yes |

Statistical significance denoted at 1%(***), 5% (**) and 10% (*). Robust standard errors in parentheses. Observations clustered within country-pairs

tructure and institutions) have the expected signs and remain consistent to changes in the model specifications. Trade costs and higher taxes will hinder foreign direct investment while good institutions will encourage foreign direct investment inflows. In addition, distance and contiguity adversely affect outward foreign direct investment sharing a common language is beneficial for cross border activity.

### 2.4.3 Robustness

#### Alternative measures of financial development and bilateral foreign direct investment

Table 2.4 illustrates the effects financial conditions on foreign direct investment using alternate measures of financing development. Column (1) provides the results from the baseline Poisson regression from table 2.2 using credit to the private sector. Stock market capitalisation to GDP, accounts for the size of the stock market. This is the average value of listed shares to GDP. In column (2), financial development measured by the equity financing variable has a positive and significant coefficient. This result is similar to the previous findings for debt financing as measured by private credit from Table 2.2 presented in column (1). Developed equity markets could boost the practicality of using this market to fund investment. Alternatively, the greater the rise in stock prices could signal potential of yielding greater rates of return on investment and elevate the credence of equity markets as avenues of raising capital resulting in more foreign direct investment, particularly for mergers and acquisitions (Jongwanich et al., 2013). Furthermore, an efficient equity market is imperative for foreign direct investment flows in the form of mergers and acquisitions as these funds provide an additional connection between local and external investors aside from employment creation and skills transfer (Alfaro et al., 2004).

In column (3) the sample size is restricted to private bond market capitalisation as an alternate measure of financial conditions. It is anticipated that firms will have access to the corporate bond market as alternative debt financing aside from access to bank loans to support investment. Bond market development is proxied by total volume of outstanding corporate bonds to GDP. As not all countries in the sample have active bond markets, the sample size is reduced from 12,645 observations in column (1) to 4,065 observations. The source and host coefficients are significant at 5% and 1% level respectively. These estimated coefficients imply that a 1% increase in private bond market capitalisation to GDP ratio is associated with a 0.15% and 0.19% increase in bilateral foreign direct investment for source countries and host country respectively.

Additionally, the credit infrastructure in countries is accounted for using two institutional based measures of financial conditions. These time invariant measures account for the institutional aspects governing the effectiveness or enforceability of financial contracts. These factors may create heterogeneity in the extent of financial development across countries. This will ultimately affect the relative ease with which firms can obtain external financing. The strength of legal rights index and depth of credit information index, both obtained from the World Bank Doing Business database are used in columns (4) and (5). The strength of legal rights index indicates "the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders" and therefore facilitates lending. It ranges from 0 to 10 for worst to best. The depth of credit information index captures "the rules and practices affecting the coverage, scope and accessibility of credit information available through either a public credit registry or a private credit bureau". It ranges from 0 to 6. Legal rights index confirms prior findings of the three outcome-based measures of financial development in column (1) to (3) of positive and statistically significant effects, although smaller. In column (5) the credit information index provides contrasting results. The source credit conditions now have a negative and significant impact on outward bilateral foreign direct investment.

The dummy for the global financial crisis is included in all regressions and provides varied outcomes. It is found with the expected negative effect and is significantly different from zero with the exception of the stock market capitalisation measures of financial conditions. Other independent variables capturing host country characteristics and trade costs are similar to the findings for private credit model in table 2.2.

The effect of financial development is likely to be correlated with other factors which impact bilateral foreign direct investment. This has been countered by considering and an exogenous change in credit or the profitability of investment. Institutions influence financial development by altering the intensity of financial market frictions. Financial frictions exist between borrowers and lenders due to the transaction and information costs associated with extending credit. These frictions affect the volume of external capital available or financial constraints encountered by the firm, (Fernández and Tamayo, 2017). Drawing from literature in Law and Finance highlights the importance of legal systems for corporate financing outcomes,(La Porta et al., 2008); financial markets develop much faster in countries with strong legal frameworks conducive for contract enforcement and protection of investors, (Fernández and Tamayo, 2017). Table 2.5 shows similar effects when country-pair fixed effects are considered.

Table 2.4: Alternative measures of financial development and bilateral foreign direct investment

| | FDI (1) | FDI (2) | FDI (3) | FDI (4) | FDI (5) |
|---|---|---|---|---|---|
| $\text{Credit}_{\text{Source}}$ | 0.288* | | | | |
| | (0.063) | | | | |
| $\text{Credit}_{\text{Host}}$ | 0.194** | | | | |
| | (0.011) | | | | |
| $\text{Stock market}_{\text{Source}}$ | | 0.265*** | | | |
| | | (0.005) | | | |
| $\text{Stock market}_{\text{Host}}$ | | 0.114* | | | |
| | | (0.064) | | | |
| $\text{Bond market}_{\text{Source}}$ | | | 0.150** | | |
| | | | (0.014) | | |
| $\text{Bond market}_{\text{Host}}$ | | | 0.195*** | | |
| | | | (0.000) | | |
| $\text{Legal rights}_{\text{Source}}$ | | | | 0.078*** | |
| | | | | (0.006) | |
| $\text{Legal rights}_{\text{Host}}$ | | | | 0.083*** | |
| | | | | (0.002) | |
| $\text{Credit index}_{\text{Source}}$ | | | | | -0.123*** |
| | | | | | (0.000) |
| $\text{Credit index}_{\text{Host}}$ | | | | | 0.030** |
| | | | | | (0.013) |
| ln GDP $_{\text{Source}}$ | 0.176*** | 0.134*** | 0.150*** | 0.792*** | 0.957*** |
| | (0.000) | (0.003) | (0.000) | (0.000) | (0.000) |
| ln GDP $_{\text{Host}}$ | 0.005 | 0.010 | 0.059** | 0.021 | 0.028 |
| | (0.744) | (0.567) | (0.036) | (0.266) | (0.139) |
| ln Distance | -0.362*** | -0.375*** | -0.349*** | -0.358*** | -0.354*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Common Border | -0.338** | -0.394** | -0.479** | -0.327* | -0.331* |
| | (0.045) | (0.018) | (0.015) | (0.056) | (0.054) |
| Common Language | 0.822*** | 0.756*** | 0.885*** | 0.776*** | 0.776*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Colonial Links | 0.245 | 0.286 | 0.090 | 0.279 | 0.277 |
| | (0.180) | (0.126) | (0.636) | (0.136) | (0.138) |
| ln Trade | -1.544*** | -1.520*** | -1.717*** | -1.575*** | -1.589*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| ln Tax | -0.723*** | -0.643*** | -1.023*** | -0.449** | -0.419** |
| | (0.000) | (0.000) | (0.000) | (0.019) | (0.024) |
| Infrastructure | 0.308*** | 0.348*** | 0.414*** | 0.346*** | 0.351*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Institutions | 0.141 | 0.112 | -0.030 | 0.144 | 0.143 |
| | (0.277) | (0.383) | (0.860) | (0.324) | (0.338) |
| GFC | -0.071** | 0.486*** | -0.299*** | -0.198*** | -0.193*** |
| | (0.027) | (0.000) | (0.000) | (0.000) | (0.000) |
| Constant | 7.459*** | 6.914*** | 14.513*** | 4.172*** | 4.764*** |
| | (0.000) | (0.000) | (0.000) | (0.006) | (0.007) |
| N | 12,645 | 10,810 | 4,065 | 9,861 | 9,861 |
| $R^2$ | 0.83 | 0.83 | 0.86 | 0.84 | 0.84 |
| Estimator | PPML | PPML | PPML | PPML | PPML |
| Source FE | Yes | Yes | Yes | Yes | Yes |
| Host FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |

Statistical significance denoted at 1%(***) , 5% (**) and 10% (*). Robust standard errors in parentheses. Observations clustered within country-pairs

Table 2.5: Alternative measures of financial development

| | FDI (1) | FDI (2) | FDI (3) | FDI (4) | FDI (5) |
|---|---|---|---|---|---|
| $\text{Credit}_{\text{Source}}$ | 0.335** | | | | |
| | (0.028) | | | | |
| $\text{Credit}_{\text{Host}}$ | 0.221*** | | | | |
| | (0.004) | | | | |
| $\text{Stock market}_{\text{Source}}$ | | 0.205** | | | |
| | | (0.032) | | | |
| $\text{Stock market}_{\text{Host}}$ | | 0.124** | | | |
| | | (0.042) | | | |
| $\text{Bond market}_{\text{Source}}$ | | | 0.272*** | | |
| | | | (0.000) | | |
| $\text{Bond market}_{\text{Host}}$ | | | 0.270*** | | |
| | | | (0.000) | | |
| $\text{Legal rights}_{\text{Source}}$ | | | | 0.082*** | |
| | | | | (0.001) | |
| $\text{Legal rights}_{\text{Host}}$ | | | | 0.104*** | |
| | | | | (0.000) | |
| $\text{Credit indx}_{\text{Source}}$ | | | | | -0.096*** |
| | | | | | (0.000) |
| $\text{Credit indx}_{\text{Host}}$ | | | | | 0.033*** |
| | | | | | (0.004) |
| ln GDP $_{\text{Source}}$ | 0.158*** | 0.125*** | 0.138*** | 0.734*** | 0.880*** |
| | (0.000) | (0.008) | (0.001) | (0.000) | (0.000) |
| ln GDP $_{\text{Host}}$ | 0.008 | 0.006 | 0.038 | 0.018 | 0.028* |
| | (0.635) | (0.721) | (0.145) | (0.304) | (0.087) |
| ln Trade | -0.400*** | -0.413*** | -0.112 | -0.456*** | -0.532*** |
| | (0.001) | (0.002) | (0.563) | (0.000) | (0.000) |
| ln Tax | -0.458*** | -0.348** | -0.931*** | -0.098 | -0.071 |
| | (0.001) | (0.020) | (0.000) | (0.575) | (0.684) |
| Infrastructure | 0.268*** | 0.298*** | 0.268*** | 0.243*** | 0.255*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Institutions | 0.195 | 0.168 | 0.120 | 0.134 | 0.122 |
| | (0.137) | (0.182) | (0.421) | (0.331) | (0.395) |
| GFC | -0.083*** | -0.150*** | -0.340*** | -0.027 | -0.024 |
| | (0.003) | (0.000) | (0.000) | (0.318) | (0.358) |
| N | 12,296 | 10,582 | 4,022 | 9,507 | 9507 |
| Estimator | PPML-CPFE | PPML-CPFE | PPML-CPFE | PPML-CPFE | PPML-CPFE |
| Source FE | | | | | |
| Host FE | | | | | |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| Country-Pair FE | Yes | Yes | Yes | Yes | Yes |

Statistical significance denoted at 1%(***) ,5% (**) and 10% (*). Robust standard errors in parentheses. Observations clustered within country-pairs

## Instrumental Variable Poisson Pseudo Maximum Likelihood

Financial development may be conditioned by institutions that vary the potency of financial market frictions. The extent of information and transaction costs lenders and borrowers encounter in the credit market may manifest through aspects such as the degree of contract enforcement or protection of property rights. Consequently, variations in credit market frictions could have an impact on the relative access to external capital by firms. Therefore, the institutional context may create disparities in the degree of financial development across countries. To determine causality, prior empirical analysis has instrumented financial development measured by credit to the private sector with dummy variables for the legal origins on laws and regulations. Therefore, the Instrumental Variable Poisson pseudo maximum likelihood (IV-PPML) approach is implemented using legal origin dummy variables as instruments for private credit (financial development). This is a similar approach to Manova (2013) and Desbordes and Wei (2014). The instruments used are the dummy variables on if a country's commercial laws are predicated on British, French, German legal origins. Data on legal origins for source and host countries is obtained from La Porta et al. (2008).

Table 2.6 reports results from a regression conducted. In column (1) reports the initial results obtained in the baseline 2.2 while column (2) reports the results from the instrumental variable estimation. The estimation results are not robust to the instrumental variables approach conducted. When source and host country private credit is instrumented with legal origins, the initial result for the effects of financial development on bilateral foreign direct investment for the host country changes from a positive to negative significant effect. This may be in line with theoretical expectation, that the effect of host country financial development on foreign direct investment is ambiguous and may generate both positive and negative outcomes for foreign direct investment,(Desbordes and Wei, 2014). Previous studies use legal origins as an instrument for financial development such as Rajan and Zingales (1998) and Kroszner et al. (2007), however its validity has been questioned by Manova (2013). This is confirmed by the test of over identifying restrictions reported in table 2.6, which rejects the hypothesis of instruments being uncorrelated with the error term. This test result is similar to Desbordes and Wei (2014) who finding robust results for the causal effects of source and host financial conditions for foreign direct investment were unable to confirm the validity of legal origins as instruments. This analysis finds similar outcomes from the Hansen test of over identifying restrictions as reported in table 2.6. Therefore, the results are not robust to legal origins, an instrumental variable for private credit, widely used in the literature.

Table 2.6: Instrumental variable regression

| | (1) FDI | (2) FDI |
|---|---|---|
| $\text{Credit}_{\text{Source}}$ | 0.288* | 0.518*** |
| | (0.063) | (0.000) |
| $\text{Credit}_{\text{Host}}$ | 0.194** | -0.694*** |
| | (0.011) | (0.000) |
| ln GDP $_{\text{Source}}$ | 0.176*** | 0.487*** |
| | (0.000) | (0.000) |
| ln GDP $_{\text{Host}}$ | 0.005 | 0.315*** |
| | (0.744) | (0.000) |
| ln Distance | -0.362*** | -0.067* |
| | (0.000) | (0.072) |
| Common Border | -0.338** | -0.446*** |
| | (0.045) | (0.000) |
| Common Language | 0.822*** | 1.059*** |
| | (0.000) | (0.000) |
| Colonial Links | 0.245 | 0.143* |
| | (0.180) | (0.088) |
| ln Trade | -1.544*** | -1.615*** |
| | (0.000) | (0.000) |
| ln Tax | -0.723*** | 0.074 |
| | (0.000) | (0.379) |
| Infrastructure | 0.308*** | 0.353*** |
| | (0.000) | (0.000) |
| Institutions | 0.141 | 0.651*** |
| | (0.277) | (0.000) |
| GFC | -0.071** | 0.053 |
| | (0.027) | (0.360) |
| Constant | 7.459*** | 5.425*** |
| | (0.000) | (0.000) |
| N | 12645 | 12645 |
| $R^2$ | 0.83 | |
| Estimator | PPML | IV-PPML |
| Source FE | Yes | Yes |
| Host FE | Yes | Yes |
| Time FE | Yes | Yes |

Over identification test: p-value 0.0003

Statistical significance denoted at 1%(***) ,5% (**) and 10% (*). Robust standard errors in parentheses. Observations clustered within country-pairs

## Effects of financial development on the components of foreign direct investment

Further empirical analysis is carried out to analyse how financial development affects the different financial instrument components of foreign direct investment. This is done by considering the effect of source and host country financial development using alternative foreign direct investment data collected from the Organisation for Economic Cooperation and Development (OECD). The data used in this section is comprised of foreign direct investment from 34 OECD source countries to the same sample of 116 emerging market and developing host economies for the period between 2005 to 2014. The sample coverage is based on availability of data. Furthermore, the dataset permits splitting of the sample according to the mode of financing of foreign direct investment. Therefore, the dependent variable FDI is classified into three different components namely; equity, debt and reinvested earnings.

Equity capital is usually linked to greenfield as well as brownfield investment (mergers and acquisitions) or broadly new investments associated with foreign direct investment. For this reason, the equity component of foreign direct investment propels most of the fluctuations in foreign direct investment flows. However, this equity component may also consist of extension of capital of financial restructuring by the multinational corporation. On the other hand, reinvested earnings are the proportion of earnings that the multinational corporation chooses to reinvest in its subsidiary as opposed to paying dividends. Therefore, reinvested earnings can be a source of financing for the subsidiaries abroad. In addition, reinvested earnings are considered more stable with adjustments to this component of foreign direct investment indicating the variations in the earnings of the subsidiary and the volume of earnings the multinational corporation decides to distribute. Therefore, higher reinvested earnings may signify the recognition of by the multinational corporation of viable investments in the host country where its subsidiary is based. A larger volume of reinvested earnings in the subsidiary abroad may be compelled by the incentive to take advantage of profitable opportunities abroad. Nevertheless, the share of reinvested earnings distributed may also fluctuate depending on the needs of the multinational corporation given that in some instances the multinational corporation may need more cash to pay dividends rather than reinvest its profits in a subsidiary abroad. Finally, intra-company debt is considered the least stable among the three financial flows. This stems from the fact that intra-company debt is inclined to be compelled by the short-term financing requirements within the firm and not broad macroeconomic conditions or investment opportunities.

Table 2.7 presents estimations of the effects of financial development on the three components of foreign direct investment. Private sector credit to GDP for both source and host country are used as the benchmark measure of financial development because it is widely used in the literature and available at a higher frequency across countries. Column (1) in table 2.7 shows the findings for aggregate foreign direct investment outflows. The coefficients for both source and host country financial development are not statistically significant. This suggests that cross-border direct investment flows are largely independent of financial development proxied by private sector credit to GDP. In column(2), foreign direct investment outflows measured as using the equity component is considered. The coefficients for source country financial development is positive and significant. Higher source country financial development increases the volume of FDI equity outflow. The coefficient for the host county is positive but not statistically significant. The estimation results for intra-company debt flows are reported in column (3). The coefficients for both source and host country financial development are negative but not statistically significant. In the last column, the analysis considers whether the results vary when using reinvested earnings. Host country financial development has a negative and significant effect on reinvested earnings. Negative reinvested earnings may be the due to the *negative indirect competition effect*. If the financial sector in the host country is developed it facilitates local firm entry into the domestic market. This enhances competition and lowers profits for multinational corporations or subsidiaries operating in the host country. If the main incentive for the multinational corporation is to serve the local market, the host country will become a less favourable destination (Bilir et al., 2014). Therefore, multinational corporations will be less inclined to reinvest earnings in affiliates abroad where there are less profitable investment opportunities due to the competition effects.

Table 2.7: Financial development effects on the components of foreign direct investment

| | Total | Equity | Debt | Reinvested earnings |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| $\text{Credit}_{\text{Source}}$ | 1.496 | 4.012*** | -0.427 | -0.483 |
| | (1.184) | (1.444) | (0.806) | (1.195) |
| $\text{Credit}_{\text{Host}}$ | -0.0223 | 0.442 | -0.671 | -0.920** |
| | (0.620) | (0.918) | (0.750) | (0.387) |
| ln GDP Source | 1.038 | 2.172* | 4.574 | 0.295 |
| | (0.858) | (1.282) | (3.175) | (0.765) |
| ln GDP Host | 1.166* | 0.385 | 1.090** | 2.578*** |
| | (0.671) | (0.758) | (0.445) | (0.524) |
| ln Distance | -0.797*** | -1.343*** | -0.604* | -0.489* |
| | (0.215) | (0.340) | (0.355) | (0.258) |
| Contiguity | -0.100 | 0.905 | -1.338*** | -0.208 |
| | (0.321) | (0.558) | (0.479) | (0.345) |
| Common Language | 1.326*** | 1.867*** | 0.690* | 1.533*** |
| | (0.276) | (0.365) | (0.360) | (0.285) |
| Colony | 0.177 | 0.167 | -0.220 | 0.0991 |
| | (0.278) | (0.412) | (0.406) | (0.394) |
| Trade | -1.149*** | 0.416 | -1.803*** | -2.062*** |
| | (0.445) | (0.674) | (0.552) | (0.613) |
| Tax | -0.288 | -1.398 | 2.089** | -0.00585 |
| | (0.578) | (0.998) | (0.907) | (0.809) |
| Infrastructure | -0.0248 | 0.413 | 0.105 | -0.618** |
| | (0.319) | (0.638) | (0.294) | (0.268) |
| Institutions | 2.156*** | 1.856 | 2.952*** | 1.378*** |
| | (0.563) | (1.175) | (1.133) | (0.490) |
| GFC | 0.432 | -0.426 | -0.530 | -1.099** |
| | (0.345) | (0.536) | (0.898) | (0.463) |
| Constant | -48.82 | -86.69* | -115.5 | -52.23* |
| | (30.94) | (48.45) | (76.57) | (27.69) |
| N | 2,342 | 2,063 | 1,973 | 1,673 |
| $R^2$ | 0.595 | 0.408 | 0.515 | 0.886 |
| Source Country FE | Yes | Yes | Yes | Yes |
| Host Country FE | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

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

## 2.5 Conclusion

In this chapter the role of financial development in both source and host countries on outward bilateral foreign direct investment was investigated. Using a broad panel dataset comprised of outward foreign direct investment from 43 high income and emerging market source countries to 116 emerging market and developing economies for the period 2001-2012. The analysis is conducted using a gravity model to explain the mediating role of financial development on outward foreign direct investment. Controlling for standard gravity variables and other determinants of foreign direct investment, this is done by considering the differential access to finance proxied by the extent of financial sector development in both originating and destination countries. The findings show that on average, greater financial development in both the source and host countries will result in more aggregate outward foreign direct investment. Therefore, the depth of financial markets has a positive impact on bilateral foreign direct investment. This confirms findings from previous papers that found a positive effect for both source and host country financial deepening, for greenfield investments, expansion and mergers and acquisitions foreign direct investment (Desbordes and Wei, 2017) and for aggregate foreign direct investment (Donaubauer et al., 2016).

The chapter also analyses the impact of financial crises on outward foreign direct investment. This is done by separately considering the role of the global financial crisis and country specific systemic banking crises. With respect to the global financial crisis, the results show on average a negative impact on bilateral foreign direct investment. Accounting for country specific financial constraints in the form of systemic banking crises provides varied evidence. Tighter credit conditions in source countries undergoing systemic banking crisis have a negative effect on aggregate outward foreign direct investment. This indicates firms are financially constrained during a systemic banking crisis and there is an adverse impact on the availability of capital for investment. This is divergent from previous findings by Gil-Pareja et al. (2013) on the effects of source country systemic crisis on the outcome for aggregate bilateral foreign direct investment. This consistent with the fact that firm access to finance tends to be restricted when credit conditions deteriorate owing to banks experiencing financial distress. In contrast, financial distress in the host country following a systemic banking crisis was found to enhance bilateral foreign direct investment.

The main policy implications of the chapter relate to both source and host countries. Countries seeking to enable the entry and growth of multinational corporations into foreign markets and those countries seeking to encourage inward foreign direct investment from multinational corporations should execute policies that will enhance financial de-

velopment. Secondly, these countries ought to put in place policies to sustain access to external financing for firms in periods of severe financial distress. Furthermore, better developed financial systems are important as gesthey will safeguard the access to external financing by local firms as domestic borrowing by multinational firms expands Desbordes and Wei (2017). This is essential in preventing a negative crowding out effect of domestic firms from the host country credit market owing to enhanced domestic borrowing by foreign firms found in Harrison and McMillan (2003). Furthermore, the composition of the banking sector between domestic and foreign banks will generate disparities in the way they provide credit to firms. To limit this potential crowding out by foreign firms in the domestic credit market, a specific enhancement that would be useful in host countries could be for policymakers to provide avenues for local firms to access credit from local banks rather than foreign banks which tend to lend more to larger firms owing to the ease of obtaining information and monitoring. In this way the entrance of foreign firms in the host country credit market will not disadvantage domestic firms. Therefore, this chapter has shown that having a well-developed financial system will be advantageous for both domestic and external investors.

## 2.A Appendix

Table 2.8: Systemic banking crises

| Source Countries | | | | |
|---|---|---|---|---|
| Argentina | France | Italy | Portugal | Switzerland |
| Austria | Germany | Japan | Russian Federation | Turkey |
| Belgium | Greece | Kazakhstan | Spain | United Kingdom |
| Denmark | Hungary | Netherlands | Sweden | United States |

| Host Countries | | | |
|---|---|---|---|
| Argentina | Kazakhstan | Philippines | Uruguay |
| Dominican Republic | Mongolia | Russian Federation | |
| Ecuador | Nigeria | Turkey | |
| Indonesia | Nicaragua | Ukraine | |

Source: Laeven and Valencia (2013)

# Chapter 3

# Unconventional Monetary Policy and Portfolio Allocation

## 3.1 Introduction

Following the global financial crisis, central banks in major advanced economies lowered short-term policy interest rates. Developed economies central banks lowered policy interest rates to the effective lower bound (ELB). These central banks in key economies alternated to implementing unconventional monetary policies in efforts to safeguard the financial system, revive aggregate demand and bolster their domestic economies from the aftermath of the global financial crisis. However, owing to increased integration between economies through real and financial channels, unconventional monetary policies adopted by systemic countries generated unintended consequences for other economies. These spillover effects were transmitted through trade linkages and financial markets as these key economies constitute the largest trade partners as well as the major sources of international finance for the rest of the world. The spillovers from the international transmission of unconventional monetary policies conducted by central bank in advanced economies have been large for emerging and developing countries (Ahmed, 2013; Fratzscher et al., 2016; Neely, 2015).

This chapter address the question of the international transmission of monetary policy through the cross-border portfolio allocation of global institutional investors. This is relevant considering the extensive use of unconventional monetary policy measures by major systemic economies, the U.S., the U.K., Japan and the Euro area, in the wake of the 2008 global financial crisis. Furthermore, this is particularly relevant for policy makers in emerging markets and developing economies as these economies were

subject to surges in capital inflows, rising equity prices, falling sovereign bond yields, real currency appreciations and enhanced corporate debt issuance by the non-financial sector due to the accommodative monetary policies executed subsequent to the global financial crisis (Fratzscher et al., 2016; Lo Duca et al., 2016; MacDonald, 2017). Comparably, the anticipation of the normalisation or reversal of expansionary monetary policy by the U.S. was associated with the depreciation of nominal currencies and reductions in stock market prices in emerging markets (Eichengreen and Gupta, 2015). In this chapter, the spillover effects of unconventional monetary policy by advanced economies central banks is assessed in terms of the cross-border portfolio allocation behaviour of institutional investors.

The extant empirical literature tackling the question of spillovers generated by monetary policy stimulus of major advanced economies has been analysed using two principal approaches, the direct and indirect approach. First, through the indirect approach, identification of monetary policy spillover effects entails analysis of the response of interest rates and asset prices in foreign countries to the unconventional monetary policy of advanced economies (Krishnamurthy and Vissing-jorgensen, 2011). Although, the cross-border transmission of monetary policy can be conjectured as occurring through the movement of capital flows across countries, the indirect approach infers the impact of monetary policy spillovers indirectly from the response of financial asset prices abroad such as stock prices and bond yields. Within the indirect approach, evidence of cross-border spillovers effects from monetary policy conducted by major economies to emerging market and developing economies have been found primarily through event studies(Fratzscher et al., 2016; Neely, 2015; Bowman et al., 2015). Nevertheless, little consensus exists on the magnitude and the path of cross-border transmission of monetary policy (MacDonald, 2017).

Second, an alternate strand of empirical literature on monetary policy transmission spillovers has focused on the direct approach. Within the direct approach, the quantity effects instead of the asset price effects of monetary policy transmission are identified. The direct approach entails determining transmission through portfolio allocation decisions or portfolio rebalancing actions of financial intermediaries across different asset classes in response to unconventional monetary policy. Initial evidence of the direct approach uses the financial flows of the major sectors of the economy as classified in the national accounts. This entails the classification of different investor groups based on the sectors of the national accounts within the source country conducting the unconventional monetary policy. Existing empirical literature on the direct approach supports the notion of investors reallocating portfolio investments in response to unconventional monetary policy. Investors that sold or had their assets purchased by the central bank tend to rebalance into riskier assets (Carpenter et al., 2015). Investors

portfolio allocation decisions across different asset classes in response to unconventional monetary policy has been illustrated within the direct approach literature using flow of funds data for Japan and the U.S. Evidence from the flow of funds data suggests that investors from whom the central bank purchased assets as part of large-scale asset purchase programs rebalanced their portfolio towards riskier assets in Japan (Saito and Hogen, 2014) and the U.S (Carpenter et al., 2015).

Third, an emerging strand of empirical literature using the direct approach, investigates unconventional monetary policy transmission using more granular institutional-level data. Augmenting initial evidence from broad sectoral-level flow of funds national accounts data, recent evidence explores monetary policy transmission using micro-level data on institutional investor firms. Joyce et al. (2017) assess the investment behaviour of both aggregate sectors and major individual institutional investors domiciled in the U.K. in response to asset purchases by the Bank of England (BOE). They analyse asset allocations of sectors from the national accounts and individual insurance companies and pension funds asset allocations in the U.K. Joyce et al. (2017) find that non-bank financial intermediaries domiciled in the U.K. altered their asset allocation from government bonds towards more risky corporate bonds, in response to unconventional monetary policy conducted by the Bank of England (BOE).

Similarly, Buch et al. (2018) provide a meta-analysis assessing the international transmission of monetary policies from four major economies' (the U.S., U.K., Japan and the Euro area) to private sector lending by banks in 17 countries. Buch et al. (2018) find evidence which suggests that cross-border spillovers from the major advanced economies occurred and bank-specific characteristics are relevant in the spillovers of monetary policy to bank credit to the private sector. Finally, Cenedese and Elard (2018) use capital flows intermediated by mutual funds to directly analyse the geographical asset allocation of mutual fund managers in response to unconventional monetary policy by the four major economies. They find evidence that unconventional monetary policies in the major economies triggered asset managers to rebalance asset allocations away from the home country implementing monetary policy to other advanced economies as a substitute asset class. However, Cenedese and Elard (2018) find no evidence of rebalancing towards riskier assets in emerging markets and developing economies in response to monetary policy stimulus from advanced economies. This negates the proposition of an increase in search for yield behaviour by international investors in response to the low interest rate environment in advanced economies and subsequent surge in capital inflows experienced by emerging markets and developing economies in the post-crisis period.

This chapter makes several contributions to the literature investigating the inter-

national transmission of monetary policies using the direct approach.

First, the empirical analysis in this chapter uses micro-level data on the portfolio composition of individual institutional investor firms. Using this granular data, the cross-border portfolio allocation of institutional investors in response to the monetary policies conducted by four key central banks is explored.

Second, this chapter focuses on the investment allocation behaviour of individual institutional investors. This is divergent from literature using data on mutual fund managers, (Cenedese and Elard, 2018) or the underlying client investors of mutual funds (Fratzscher et al., 2016). The portfolio allocations of 94 individual institutional investors firms domiciled in 13 countries are analysed over the period 1999Q4-2016Q4. Using this institution-level data, the transmission of monetary policy as a consequence of the portfolio rebalancing of investment allocations by non-bank financial intermediaries is examined. Fratzscher et al. (2016) examine capital flows intermediated by mutual funds. Their data captures the allocation behaviour of both the fund managers and the underlying investors. This implies that inferences drawn from these capital flows may be confounded by the changes in wealth of the underlying individual investors rather than just portfolio rebalancing by the fund managers. On the other hand, Cenedese and Elard (2018) use the same database but avoid this problem by investigating the geographical allocation of fund managers and not the underlying clients. Nevertheless, the firm-level data used in this chapter allows for the investigation of the direct portfolio allocation choices of the individual institutional investor firms rather than underlying investors investments in mutual funds such as country mutual fund flows data used in previous studies.

Third, this chapter examines the quantity effects rather than the asset price effects of international monetary policy transmission. This is distinct from prior studies using the response or changes in financial market asset prices within the indirect approach literature to identify international transmission of unconventional monetary policies. These studies infer the spillover effects indirectly through the sensitivity of bond yields, exchange rates and stock prices following unconventional monetary policy actions by the major economies(Rogers et al., 2016; Krishnamurthy and Vissing-jorgensen, 2011; Gagnon et al., 2011; D'Amico and King, 2013) .

Fourth, this chapter analyses the international transmission effects of unconventional monetary policy originating from four systemic countries using different proxies of the monetary policy stance. This allows the assessment of whether the choice of proxy used to account for the monetary policy stance when policy rates are at the effective lower bound (ELB) is consequential in determining the cross-border transmis-

sion of monetary policy. While the analysis of monetary policy transmission effects originating from different major central banks is similar to the prior work of Buch et al. (2018) on bank lending and Cenedese and Elard (2018) on mutual funds' asset allocation, this chapter is distinct. Specifically, this chapter focuses on a different type of financial intermediary. It examines the international transmission of monetary policy originating from major central banks in four advanced economies on institutional investors' cross-border portfolio allocation.

Therefore, this chapter examines the spillovers from monetary policies of central banks in four major systemic economies in relation to portfolio allocation of institutional investors. Previous work investigating the link between portfolio allocation and monetary policy concentrates on individual central banks in advanced economies and the response of agents following the implementation of unconventional monetary policies. Prior work provides evidence on portfolio balance (reallocation) effects from Bank of Japan asset purchases (Saito and Hogen, 2014), European Central Bank asset purchases(Koijen et al., 2016), Federal Reserve Bank large-scale asset purchases (Carpenter et al., 2015) and Bank of England asset purchases (Joyce et al., 2017). Only Cenedese and Elard (2018) analyse the international transmission effects of monetary policy by four systemic advanced economies central banks and the implications for portfolio rebalancing by mutual funds. Buch et al. (2018) also examine the cross-border transmission of monetary policy from the U.S., the U.K., Japan and the Euro area. However, they focus on the degree with which the transmission of the monetary policies in these major economies spillover and impact bank lending to the private sector.

The chapter proceeds as follows. Section 3.2 describes the background and relevant literature of monetary policy from advanced economies and the theoretical transmission channels. Section 3.3 discusses the prior evidence in the empirical literature. Section, 4.3 describes the data. Section 4.2.5 describes the empirical framework, specification and methodology. Section 4.5 presents the results from the institutional investors and interprets the key findings. Section 4.6 concludes.

## 3.2 Related Literature

Monetary policy implementation can be distinguished on two principal analytical approaches (Borio and Zabai, 2016). The first approach can be classified as interest rate policies. This is comprised of the central bank tools that signal the monetary policy stance to the private sector. The second approach can be classified as balance sheet

policies. This also involves market operations that alter the amount of bank reserves in the financial system.

### 3.2.1 Interest rate policies

An interest rate policy, which entails the central bank determining the short-term interest rate and providing information as guidance for expectations on future short-term interest rates. In this approach, the policy rate set by the central bank is the primary communication tool and gives the monetary policy stance. However, the level of the policy rate does not restrict the monetary policy stimulus. This implies that for a given short rate, there will be different yields and asset prices corresponding to changing financial conditions.

#### Short-term policy rate

The central bank sets the short-term nominal interest rate. In the post-crisis era, the limitations of cutting the short-term rate became apparent as interest rates reached the effective zero-lower bound. The alternative was alternate to other non-conventional policy tools. Only Japan and ECB have lowered interest to below zero or adopted the negative interest rates in the post-crisis period(Borio and Zabai, 2016).

#### Forward Guidance

The central bank also provides communication regarding the future path of policy. The objective is to guide private sector expectations on the future short-term interest rate. This involves providing information on the state of the economy and central bank actions. However, in the zero-lower bound era, communication from the central bank has served as tool to signal commitment to the unconventional monetary policy. Considering, interest rates were at the effective lower bound, the tools at the disposal of the central bank in the post-crisis era were limited to either swaying expectations through forward guidance or balance sheet policies-asset purchases-in particular.

The contents of forward guidance provided by the central bank may be calendar-based or state contingent. The former relates to communication from the central bank referring to a particular period. Whereas, the latter refers to communication from the central bank containing references to the state of the economy. Furthermore, this

guidance may also consist of specific quantitative or numerical content and less explicit or qualitative information.

A hypothesised view is that, there should be credibility and pre-commitment by the central bank for forward guidance to work. The central bank commits to a policy and executes it. In reality, the central bank does not deem announcements as a prior commitment. However, divergence from these announcements has cost to reputation. Rather they are viewed as a way to explicate targets or emphasise persistence to meet policy goals.

Evidence demonstrates that forward guidance is an effective tool for impacting bond yields. However, there are differentiated effects from the four major central banks. This is due to two things. Incomplete comprehension of the information provided by the central bank. Owing to complexity or ambiguous statements from the central bank or due to statements made based on the state of the economy which may not be clearly explicated. This may dampen the effects of forward guidance. Furthermore, the extent to which the guidance is accepted and incorporated by the private sector may also affect the efficacy of forward guidance a monetary policy tool. The central bank cannot promise uniformity in the subsequent policy commitments for long-term horizons, i.e. after one or two years. Furthermore, the private sector may have a different perspective on the state of the economy.

### 3.2.2 Balance Sheet Policies

The second classification of monetary policy tools is the balance sheet policies. These policies are distinct from the interest rate policies and are a more direct way for the central bank to affect the market conditions. This entails the central bank altering the magnitude, structure and riskiness of its balance sheet. The aim is to affect segments of the financial market beyond the market for bank reserves, particularly where the central bank has less direct control. Balance sheet policies takes several forms of monetary operations.

The four major central banks had key differences in the targeted assets used to support the balance sheet expansion policies. The distinction of these balance sheet expansion can be delineated between liquidity operations and monetary policy interventions. The former operations reflected the conventional lender of last resort function of the central bank and aimed at easing liquidity conditions for the banking system. The objective is to ensure that the banking sector was liquid and able to function. The latter consist of central bank interventions aimed at assets held by the private sector

with specific characteristics. The heterogeneity in the implementation of balance sheet policies broadly varied between repurchase agreements(repos) or outright purchases, the purchase of public sector or private sector assets and the purchase of long-term maturity or short-term maturity assets Haldane et al. (2016). Therefore, the market intervention arm of balance sheet expansions can be distinguished on the basis of the extent to which they alter the composition of private sector balance sheets, the type of asset and segment of the financial market the central bank operations are targeting.

Comparatively, the balance sheet policies implemented by the major central banks can also be typified by the structure of the financial system in the country implementing the unconventional monetary policies. For example, the Federal Reserve in the U.S. focused on affecting the non-bank sector owing to the market-based structure of its financial system. In contrast, the ECB targeted the banking sector owing to the financial system being more bank-based.

### Quasi-debt management policy

### Public sector asset purchases

This encompasses the use central bank balance sheet expansion policy as a monetary policy tool. The central bank conducts large-scale asset purchases of government securities with the objective of impacting the yield curve of government debt assets. This in turn alters interest rates and assets prices in the economy. These are policies aimed at affecting the market for government debt assets. The central bank aims to affect the term (maturity) and liquidity premia of the government debt asset and in turn affect asset prices and interest rates. The central bank targets this segment of the financial market and affects the volume or amount of government(public)sector assets in the possession of the private sector. These claims on the public sector consist of assets of different maturities and risk profiles and bank reserves at the central bank held by different segments of the private sector. The initial use of quantitative easing policies was implemented by the Bank of Japan. Following consecutive reductions, the actual short-term policy rate approached the lower bound for nominal interest rates in 1999. The Bank of Japan, consequently, began expanding its balance sheet in 2001, providing liquidity to the financial system by purchasing Japanese government bonds through the creation of bank reserves, (Haldane et al., 2016). These balance sheet expansion measures were further implemented by the Federal Reserve Bank and the Bank of England in 2008 and 2009 respectively. Whereas, the European Central Bank commenced with its asset purchase program in 2015. Expansionary balance sheet policies supplement

the traditional role of the short-term policy rate when it is at the lower bound. Implementation entails the outright purchases of government debt securities supported by central bank reserves. The historical use of the central bank expansionary policies has been linked to the financing of wars and other government activities as well as the attenuation of financial crises such as the bail-out of banking systems rather than a policy tool (Haldane et al., 2016). However, following the global financial crisis, central bank interventions in the four major economies have predominantly used the balance sheet as a tool to attain monetary objectives aimed at bolstering economic activity.

### Credit Policy

#### Liquidity provision and private sector asset purchases

This involves expansionary balance sheet operations by the central bank aimed at particular segments in the market for private sector assets. Through direct market intervention, the goal for this form of monetary operations is to adjust credit conditions for the private sector. The central bank exposure to the private sector is adjusted by changing the asset composition of private sector balance sheets. This is done by central bank lending or provision of liquidity or credit to specific markets. When financial conditions were significantly constrained at the beginning of the global financial crisis, repurchase agreement operations were more predominantly used by the Federal Reserve, Bank of England and European Central Bank. This was to ensure the continual transmission of monetary policy, specifically the liquidity and smooth operation of the banking sector. In addition to the purchase of the low risk long-term public-sector assets which alters the duration risk in the private sector, central bank balance sheet expansions have also involved the purchase of private sector assets. The aim of this credit easing policy is to lower credit risk in the private sector through central bank purchases of risky assets. For instance, the Bank of Japan monetary easing policy broadened the array of assets targeted for purchase beyond government bonds to include purchases of corporate bonds, commercial paper, equities, and asset backed securities, Haldane et al. (2016). The Federal Reserve Bank policy also included the purchase of mortgage backed securities and federal agency debt. Similarly, the Bank of England asset purchases was also extended to include corporate bonds. The ECB also further extended the range of assets to include corporate bonds and asset backed securities.

**Forward Guidance**

**Balance sheet expansion**

However, adjustments in the composition of the private sector balance sheets in response to monetary policy stimulus may not be adequate to fully drive the response of prices and financial conditions to changes in the monetary policy stance. An additional dimension of central bank policy tools in the implementation of monetary policy has been communication. Central bank communication conveying information on its intentions and conduct of monetary operations are also important. Communication from the central bank providing information on the evolution of the balance sheet is also important for the private sector. The forward guidance on balance sheet policy operates primarily through the signalling channel of monetary policy.

The balance sheet policy of foreign exchange market intervention involves the purchase and sell of foreign currency to affect the level of the exchange rate independent of the policy rate. Through central bank intervention in the foreign exchange market, the degree with which the private sector is exposed to foreign currencies is controlled for a given policy rate, thus the level and volatility of the exchange rate is managed. This action has been undertaken by central banks in emerging economies in efforts to stem off the unintended effects of unconventional monetary policies implemented by the major central banks.

### 3.2.3 Monetary policy transmission mechanism channels

There are various transmission channels through which monetary policy generates effects. The bond yield which is comprised of the anticipated average short-term interest rates and the term premium will be directly impacted by central bank monetary policy. The different channels of monetary transmission relate to how central bank policy affects the two components of the bond yield. The channels through which investors respond to adjustments in the monetary policy stance represent frictions or constraints that investors face when undertaking investments. Each channel is driven by different information and market frictions.

### Signalling Channel

This channel refers to monetary policy actions influencing the first component of the yield, the expected average short-term interest rate. This component reflects market expectations of the average short-term interest rate. The signalling channel operates through lowering the expected short-term rate. Through its effect on the first component of the bond yield, adjustments in the monetary policy stance to lower short-rates influences bond yields to decline. This channel operates through market expectations of the private sector formed from policy actions and communication conveyed by the central bank. Similarly, the execution of balance sheet policy in the form of asset purchases of long-term bonds can serve as indication of commitment by the central bank. This can act as a signal from the central bank to maintain low short-term policy rates. The signalling channel will likely have an impact on passive reallocation of assets due to changes in prices, (Cenedese and Elard, 2018).

### Portfolio Balance Channel

The portfolio balance channel links the effects monetary policy to the second component of the bond yield, the term premium. The term premium represents compensation to investors for the risk arising from changes in the interest rate. Furthermore, the term premium may be indicative of the presence of fragmented asset markets. This segmented asset market is reflective of distinctive asset characteristics related to maturity, risk and other factors that investors will consider depending on their underlying objectives for undertaking the investment, (Cenedese and Elard, 2018).

Considering that investors have different preferences for assets depending on their objectives, changes in the availability of certain assets may induce adjustments in their investment allocation behaviour. For example, in the period following the global financial crisis, the four advanced economies engaged in large-scale asset purchases. As part of the unconventional monetary policies, this entailed the purchases of long-term securities and in the case of some central banks other assets classes including corporate bonds and equities. These targeted asset purchases by the central banks in turn affected the stock of assets available in the market, the price and return on the asset.

Correspondingly, in response to the targeted central bank purchases, investors alter their portfolios and search of alternate assets as substitutes investments. This search for alternate assets to the ones purchased by the central bank will include assets in either

the domestic market or in foreign markets. These domestic or foreign assets substitute the assets bought by the central bank as part of the asset purchase program.

The balance sheet policy of asset purchases by the central bank asset purchases will change the availability of long-term bonds and the total maturity risk. As the central bank purchases the targeted assets (long-term government bonds), the return or yield on the assets purchased falls. This induces investors to sell their holdings of the long-term bonds to the central bank. The term premium on the long-term government bond yield reduces following central bank purchases. These asset purchases also alter the interest rate premium on other bonds although not directly purchased by the central bank. This implies that purchases by the central bank may induce lower term premium of interest rates of other securities within the same asset class. For example, the purchase of long-term bonds by the central bank may induce a reduction in interest rates for other fixed income securities. This is because the balance sheet policy of asset purchases lowers the supply of long-term bonds available to the private sector and the term premium. This in turn alters the total amount of maturity risk associated with the long-term fixed income assets available to the private sector.

Furthermore, central bank asset purchases push out investors from the bond market, it is anticipated that this will generate spillover effects on the price of various other asset classes. The portfolio rebalancing by investors affected by the central bank asset purchases will have supplementary price effects on a broader range of assets and not exclusively on the asset class (long-term government bond) targeted by the central bank purchases,(Cenedese and Elard, 2018).

There are several factors that account for the portfolio balance effect of balance sheet policies (asset purchases) in reducing the long-term yield and generating a temporal rebalancing toward riskier emerging market and developing economies assets. These factors include, the yield curve (the difference between long-term interest rate and the short-term interest rate), the risk premium, gross domestic product (GDP) growth, inflation, expectations of the future short-term rate, exchange rates, external fundamentals (current account). These factors support the notion that the rebalancing toward riskier emerging market and developing economies assets has been on account of a fundamentals-based approach. This implies that factors related to risk perceptions (sovereign credit ratings of host countries), external (current account) may account for the portfolio balance effect.

**Risk-Taking Channel**

The risk preferences and risk tolerance of the private sector are also impacted by the central bank balance sheet operations. Balance sheet expansion, the associated easing in credit conditions and the simultaneous withdrawal of risky assets from the portfolios of the private sector may induce changes in investment behaviour. This alters the risk structure of the private sector assets. The balance sheet expansion may lower risk perceptions and prompt greater risk-taking by the private sector. This is because central bank purchases are likely to be viewed by the private sector as a commitment to keep interest rates low.

The risk-taking channel effect may be further exacerbated by the search-for-yield behaviour of investors which is linked to benchmark long-term assets having low yields. This may push the private sector investors to search for similar long-term duration assets with high yields albeit riskier than the benchmark assets. This implies that the private sector in search of high yields will seek to rebalance their portfolios with longer maturity or assets with higher risk.

Therefore, the efficacy of monetary policy transmission channels is reliant on market distortions or frictions within the operations of financial markets. The presence of these market distortions or frictions enables monetary policy to have larger effects on financial market asset prices. The absence of these distortions would lower the degree of sensitivity of asset prices to the monetary policy stimulus. These imperfections in the operation of the financial market are broadly classified as information frictions and market frictions, (Haldane et al., 2016). These two frictions form the basis of the analytical distinctions between the various transmission channels of monetary policy. The channels of transmission for central bank expansionary balance sheet policies remain debated. There are various factors underlying the operation of these channels. Furthermore, there are distinct policies that were used in the pre-crisis era and post-crisis periods.

## 3.3 Empirical evidence on monetary policy and asset allocation

The initial conduit for the transmission of unconventional monetary policy to the economy occurs through the impact of the balance sheet expansion on asset prices, (Haldane et al., 2016). The impact of monetary easing policies of large systemic advanced

economies, (U.S., U.K., Japan and the EU) on various assets and financial flows have been quantified by several studies. These systemic economies have great financial and trade linkages with the rest of the world. The principal effects from these monetary easing policies have been currency appreciation and capital inflows. The international transmission of advanced economies monetary easing impinge generates challenges to macroeconomic management and raise asset prices. The spillovers arising from availability of greater liquidity at a lower cost has resulted in a build-up in foreign currency exposure by emerging markets and developing economies. This build-up in foreign currency exposure, threatens the solvency of domestic balance sheets. Furthermore, the availability of funds at a lower cost, promotes credit growth and asset price increases. Therefore, the literature identifies the cyclical and structural determinants that have resulted in emerging and developing countries receiving the effects generated from the international transmission of monetary policies. The literature quantifies balance sheet expansions or quantitative easing and its effects on asset prices and interest rates( government bond yields, equities and exchange rates ), the size of capital flows, and the financial institutions involved in intermediating global financial flows. Several conclusions can be drawn regarding the effects of quantitative easing according to Haldane et al. (2016). Quantitative easing had material impact on financial markets or asset prices both local and external as evidenced from event studies. They are state dependency effects and quantitative easing may vary over time depending on the state of the economy and the financial system. Furthermore, quantitative easing has strong spillover effects to other countries, especially through financial market channels. Finally, quantitative easing had distributional consequences for households and financial intermediary's asset holdings and portfolio allocation choices. Fratzscher et al. (2016) find evidence of portfolio rebalancing and that actual asset purchases by the Federal Reserve Bank had a bigger impact in comparison to policy announcements. In general, the impact of quantitative easing has been to lower the yields on long-term governments bonds,(Krishnamurthy and Vissing-jorgensen, 2011; Gagnon et al., 2011; Neely, 2015). They find evidence of the flattening of the yield curve following central bank balance sheet expansion.

The use of asset purchases as an alternative monetary policy tool to the conventional interest rate has broadly investigated by analysing the effects of purchases on interest rates and asset prices. The effect of central bank purchases in lowering the long-term yields and generating a temporal rebalancing toward riskier assets, through evidence of this channels has been found by examining indirectly the effects of central bank asset purchases on asset prices and less evidence is available on the direct effects of balance sheet policies on the investment patters on financial intermediaries. This type of investors would be more sophisticated and likely to engage in arbitrage across

markets (Carpenter et al., 2015). Hence, we would expect a movement into different asset classes if the portfolio balance channel is in effect. These investors would be more dynamic and responsive to shocks faster than other sectors. Therefore, we would expect that purchases by the central bank would affect the holdings of securities by these investors.

At a more granular level, an institutional investor firm will face an optimization problem for a given amount of money to maximise utility subject to a budget constraint along with other institutional specific factors such as the liabilities. The institutional investors will also have to consider the risk preferences of various groups. Furthermore, regulatory requirements may also impose additional constraints to the institutional investor's asset allocation decision. Therefore, while the institutional investor may follow a strategic asset allocation approach considering the firm specific requirement, the investor may also engage in tactical asset allocation to exploit temporal changes in market conditions, (Joyce et al., 2017).

The underlying mechanism for the operation of the balance sheet policies is the changes in actual portfolio holdings made by financial institutions in response to the market intervention by the central bank through asset purchases rather than based on changes in asset prices. The empirical evidence on portfolio rebalancing has been primarily concerned with answering two questions from the perspective of the central bank. Firstly, which entities reduce government holdings when the central bank purchases long-term securities. Secondly, in which asset classes do these sectors increase investment or asset holdings. To assesses which firms, reduce the holdings of long-term government assets (bonds), there is need to assess the net change in government holdings for a given investor on the amount of asset (bond) purchases by the central bank. These two questions have been addressed at the macro-level using data at the sector level from the balance of payments of the country conducting unconventional monetary policy. These aggregate data from the flow of funds accounts allow the observation of shifts of asset holdings by various sectors of the economy for different asset classes.

This is done in Carpenter et al. (2015) and Saito and Hogen (2014) using comprehensive sector-asset allocations to broad asset categories within the U.S. and Japan respectively. These aggregate level studies are based on national accounts data on the flow of funds by sector. These studies report evidence of adjustments in holdings towards riskier assets following quantitative easing policies in Japan and the U.S.

The portfolio balance transmission channel of unconventional monetary policy has been assessed by analysing the response of investors in different asset markets with Carpenter et al. (2015) lending support to the preferred habitat hypothesis. With

low frequency financial accounts data on quarterly holdings of various assets classes by eight different investor sectors (households, broker-dealers, insurance companies, pension funds, investment companies), they explore which investors sell assets to the Federal Reserve Bank during the four different phases of quantitative easing and how the composition of these private investors' portfolios changes with the asset purchases. They find evidence of market segmentation in line with the preferred habitat theory and portfolio rebalancing in the transmission of unconventional monetary policy within asset markets. They conclude that households, broker-dealers and insurance companies were the major sellers of assets to the Federal Reserve Bank during the large-scale asset purchases. Furthermore, large-scale asset purchases by the Federal Reserve Bank are associated with rebalancing of portfolios by private investors towards other assets classes such as corporate bonds, commercial paper, municipal debt and loans.

Saito and Hogen (2014), undertake a similar approach to assess the portfolio balance channel from the Bank of Japan bond purchases following the Qualitative and Quantitative Easing (QQE). With bank loans and the net acquisition of financial assets by each sector within Japan, Saito and Hogen (2014) explore which firms lowered their holdings of government bonds with the onset of the QQE program. Evidence from the broad sectors in the flow-of-funds data showed that local Japanese banks and non-residents sold assets to the Bank of Japan or reduced government bond holdings during QQE. Additionally, these two sectors further increased investment in other assets including, corporate bonds, equities and mutual funds. In contrast, insurance companies, pension funds did not lower their holdings of government bonds when the Bank of Japan conducted purchases of long-term Government bonds under the QQE. Arguably this is due to their liability structure being more long-term in nature and they would be less responsive or induced to lower their investment in long-term government bonds due to the need to match their long-term liabilities with long-term assets. This analysis is carried out using investment flows and bank lending data from the Flow of Funds Accounts statistics of Japan. These effects vary depending on whether the Bank of Japan purchased short-term or long-term bonds.

Divergent from the prior studies using the national accounts data on the flow-of-funds by sectors from the financial account, Joyce et al. (2017) and Bua and Dunne (2017) analyse the rebalancing effects of quantitative easing using micro-level data based on the actual portfolio allocations. With data on the net acquisition of bonds instead of asset stocks for each sector, Joyce et al. (2017) find evidence of a rebalancing effect arising from asset purchases by the Bank of England at the aggregate sector level similar to Carpenter et al. (2015) and Saito and Hogen (2014). Institutional investors were the major sellers of Government bonds and rebalanced their portfolios towards corporate bonds. Net purchases by the Bank of England or quantitative easing lowered

the net investment flows or net acquisition of government bonds by investors in five distinct sectors. They further supplement this sectoral-level evidence with micro-level data from the portfolio allocations of two sectors; pension funds and life insurance companies in the U.K. For life insurance companies, the impact of quantitative easing was negative on the allocation to index bonds and equities and positive on the allocation towards corporate bonds. This indicates the rebalancing of allocations by these firms from government bonds to corporate bonds. In contrast to insurance companies, pension funds increased the allocation toward both index-linked bonds and corporate bonds, as the Bank of England purchased bonds and lowered their allocation to nominal government bonds.

An alternative empirical analysis using micro-level data is undertaken by Bua and Dunne (2017) to assess how the ECB's asset purchases affected the portfolio composition of the investment fund sector domiciled solely in Ireland. They use both the positions and transaction-level data on net purchases of assets by one group of investors, investment funds, to assess the effects of Euro system's Asset Purchase Program (EAPP). The transaction-level data provides a more detailed analysis and is distinct from the approach of Joyce et al. (2017), which depends on the net acquisition of assets by pension funds and insurance companies to assess evidence of portfolio rebalancing. Bua and Dunne (2017) argue that consideration of the net purchases of investor firms allows identification of active rebalancing behaviour, which will be distinct from a passive portfolio rebalancing outcome that occurs simply from changes in value of holdings. Therefore, the analysis in Joyce et al. (2017) may merely be capturing a valuation effect rather than an actual change in the composition of the firm's portfolio. Granular information on the strategies of each investment fund in their sample further permits identification of funds that adjust their portfolios following the EAPP. They find evidence of rebalancing towards securities from outside the EU area.

Koijen et al. (2016) also analyse the impact of the ECB's asset purchases on banks, insurance companies, pension funds, and mutual funds. Portfolio holdings of government bonds, corporate bonds, equities and asset backed securities are used. They find ECB purchases result in the foreign sector selling more government securities compared to banks, mutual funds and insurance companies.

Evidence of cross-border investment allocations or asset positions in different categories at more granular levels remains limited. Related literature utilises the bilateral allocation of assets based on aggregate data compile in the IMF Coordinated Portfolio Investment Survey(CPIS). Portes and Rey (2005b) study portfolio allocation across countries in a gravity-model framework using the CIPS data. Similarly, a gravity model framework is applied to euro area security-level data on holdings by, Boermans and

Vermeulen (2016) to examine cross-border portfolio allocation. Literature accounting for the effects of monetary policy on the actual asset allocation or portfolio composition at the micro-level is limited. Other prior work incorporating the role of quantitative easing (QE)/large-scale asset purchases (large-scale asset purchases) and using disaggregated data on the holdings of institutional investors has been based on pension and insurance companies in the U.K.in response to BOE quantitative easing, Joyce et al. (2017) and investment funds in Ireland, Bua and Dunne (2017).

The unconventional monetary policy effects can be identified based on the impact on the private sector balance sheets and the segment of the market the central bank aims to affect as highlighted by Borio and Disyatat (2010). The adjustments in the composition of balance sheets of the private sector are an important conduit for the transmission of unconventional monetary policy. These balance sheet policies are further separated from the level of the interest rate. This decoupling also ensures that any changes in the levels of interest rates such as a policy shift toward higher interest rates can be implemented independent of the balance sheet policies. Therefore, the magnitude and composition of the central bank balance sheet can be altered independent from the policy rate target. The implications of this decoupling principle are that the changes in the balance sheet policy toward contraction of the central bank balance sheet is not prerequisite for increasing interest rates (Borio and Disyatat, 2010).

Other studies focus on the transmission of external monetary policies through financial institutions (banks and non-banks), inward and outward monetary policy transmission. Where inward transmission is primarily referring to the boost in domestic lending by banks as a result of external monetary policies. Baskaya et al. (2017). Furthermore, frictions that the institutions face related to the liquidity and capital position are important in the transmission of monetary policy.

## 3.4 Data and descriptive statistics

This section provides details on the institutional investor firm-level outcome variable, the different monetary policy stance proxies and control variables used in the study.

### Institutional investor data

Data on 94 institutional investors are collected and compiled from Bloomberg. The micro-level dataset consists of asset holdings of the largest individual private insti-

Figure 3.1: Asset classes


tutional investors recorded in millions of U.S. dollars. This covers individual asset positions of the largest asset managers as measured by the industry's global assets under management (AUM). The choice for inclusion of investor firms in the sample is based on the top asset management by global assets. The firms included in the sample hold over 80% of global assets under management and represent the largest firms in the industry according to total assets under management as compiled by Investment Pensions Europe (IPE). IPE collects data on the leading 400 asset managers both globally and in the European market since 2002.

The sample covers institutional investor holdings of different assets compiled on a quarterly frequency. For each firm and quarter, the dataset contains the nominal investment in different asset classes denominated in U.S. dollars. This low frequency firm-level data allows observation of the end-quarter stock positions of different asset classes for each firm. Figure 3.1 plots the portfolio composition or various asset classes held by the firms included in the sample.

The dataset covers salient attributes the composition of each firm's portfolio that include the firm domicile, the asset class(e.g. bonds or equity), the destination country of each asset and main currency denomination of each asset. For the empirical estimation, only two asset classes (bonds and equity) are used to refer to these dimensions of disaggregation of assets within each firm portfolio. The length of panel sample period is 1999Q4 to 2016Q4, a total of 69 quarters. This covers the periods of both conventional and unconventional monetary policy implementation by the four major central banks.

In Figure 3.2, the average end of quarter portfolio allocations by asset type in the sample is plotted. The 94 institutional investor firms in the sample are domiciled in 13 countries. The data also provides information on the destination country of the various

Figure 3.2: Average portfolio composition across asset classes

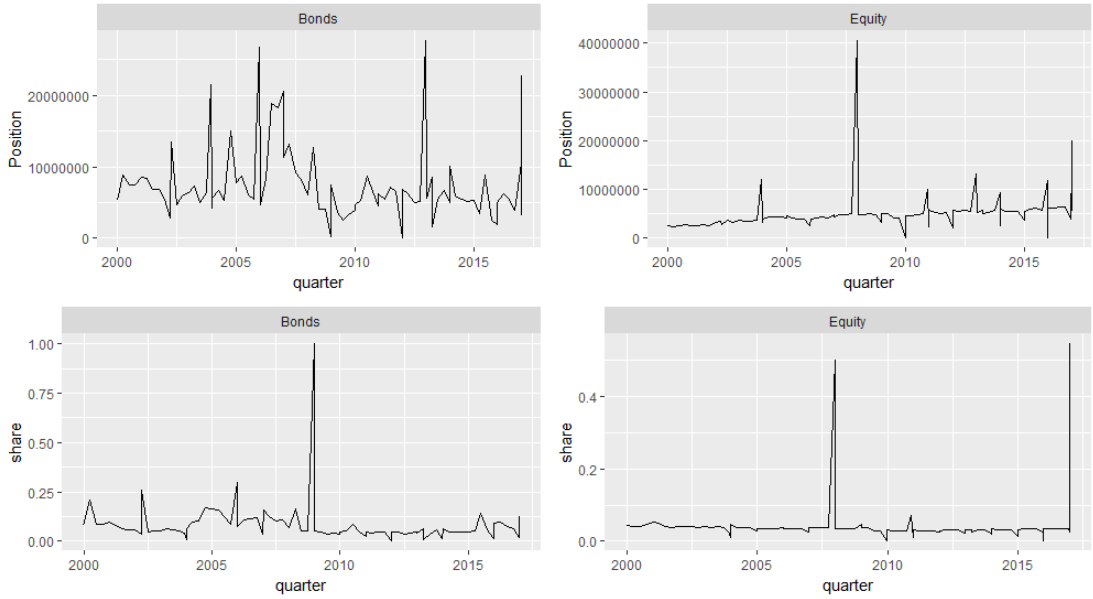
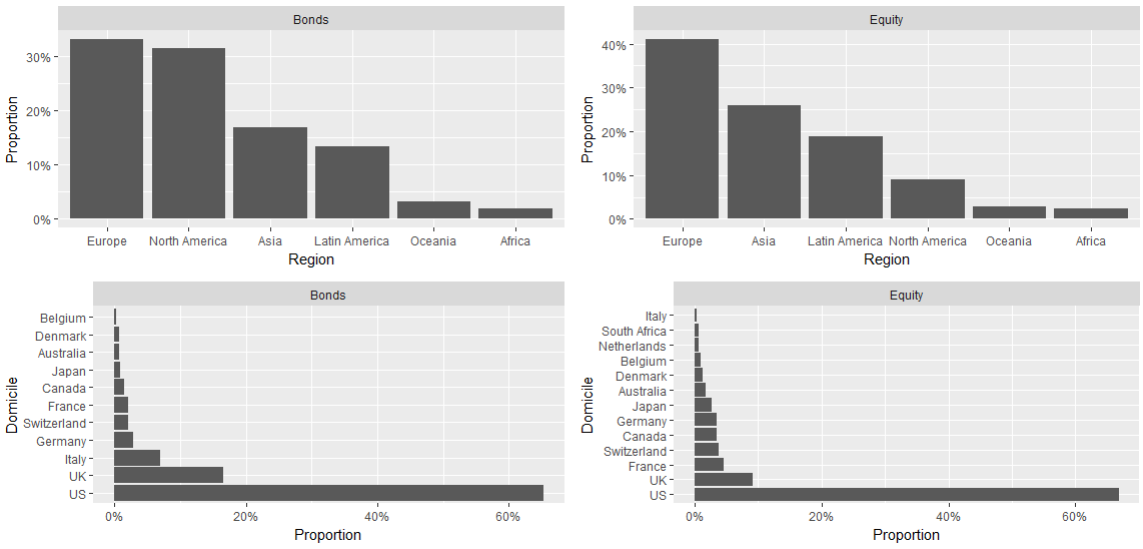



Figure 3.3: Portfolio investments by region and firm domicile

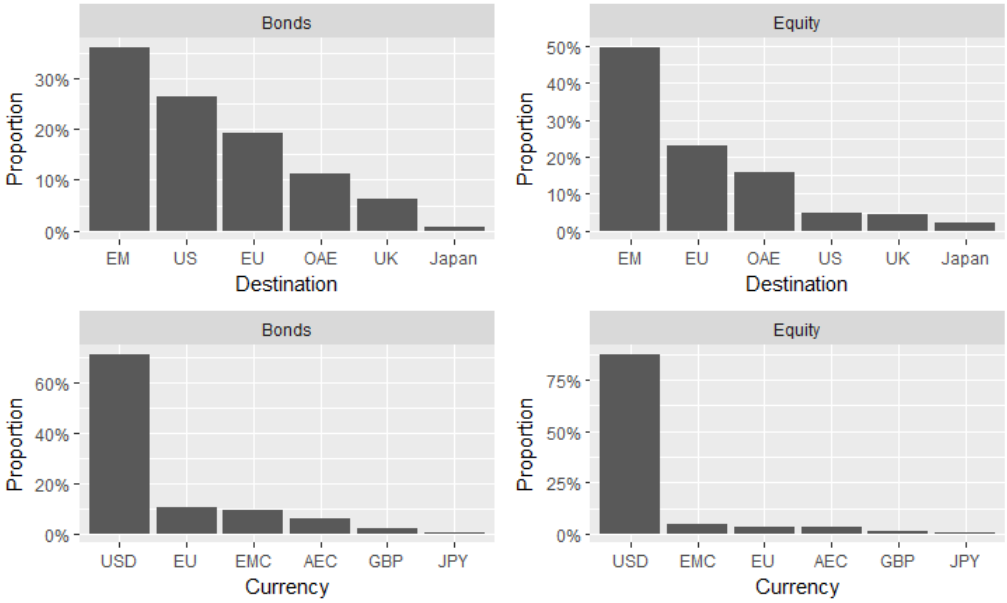



assets the institutional investors have allocations.

In figure 3.3 the summary on the institutional investor asset allocation for the sample period 1999-2016 are presented. Figure 3.3 shows the different destination regions for bond and equity investment by the institutional investors. The destination region for portfolio allocation to bonds is mainly in Europe, North America and Asia. While for equity, the main destinations are in Europe, Asia and Latin America. The major portfolio allocation is from institutional investors in the US and UK in both asset classes.

Figure 3.4 plots the bond and equity allocations across different destinations grouped into major country groups: Emerging Markets(EM),the four major advanced economies (U.S.,U.K., E.U. and Japan), other advanced economies (OAE) such as Denmark, Swe-

Figure 3.4: Asset Allocations by destination and currency




den. The share of the portfolio allocation is largest in emerging markets, the U.S and E.U. for both bonds and equities. In particular for equity, the largest allocations by the institutional investors in the sample are in emerging markets, the EU and other advanced economies. The second panel in Figure 3.4 shows that portfolio weights or allocations in both bonds and equities by the sampled institutional investors are heavily concentrated in assets denominated in the US dollar. Allocation by the currency denomination are to a lesser extent in assets denominated in the Euro, emerging market currencies (EMC) and other advanced economies currencies (AEC). The list of countries for firm domiciles and destination countries used in the sample are presented in the appendix in table 3.40.

### Data cleaning of sample

To keep the data tractable, the chapter focus on the largest asset managers as measured by global assets under management for which consistent data was readily available. Although the sample covers only 94 institutional investor firms, the granular nature of the data allows for a deeper analysis. Before the empirical analysis the data is cleaned to obtain the final detailed dataset on the international asset allocations(portfolio holdings) of the institutional investors. Several steps were applied to the raw data. These include the exclusion of all other asset categories and retention of bond and equity investment holdings. Winsorisation of portfolio holdings at the 5% and 95% levels, to limit the influence of outliers. Finally, the exclusion of firms reporting portfolio holdings for less than 8 consecutive quarters.

**Limitations of sample data**

A notable limitation of the data is that it does not include balance sheet or firm-level characteristics such as firm size, assets-to-liabilities ratio or similar firm-specific characteristics. The inclusion of these factors would more closely account for the frictions which these financial intermediaries encounter. This lack of information on investors constraints or balance sheet conditions at the individual firm level is a constraint. The magnitude and composition of the balance sheet may be important to identify information regarding the firm leverage (or liquidity constraints) or strength of the balance sheet. The liability structure of institutional investors differentiates them from other types of investors. The need to fulfil their mandates and attain high returns will influence their portfolio allocation.

Accordingly, the risk-taking appetite of investors can also be viewed as being reliant on both the prevailing macroeconomic environment and the balance sheet conditions of investors. On that account, the increase in the demand for assets by institutional investors from advanced economies can be viewed as underlying the surge in capital flows from advanced economies to emerging markets. Evidence has been found that the surge in demand for emerging market assets is a consequence of the combination of a low interest rate environment, low asset returns and weak investor balance sheets which prompts search for yield behaviour by insurance companies and pension fund firms,(Bonizzi, 2017). In this context, weaker balance sheets refer to investors having greater liabilities than assets (low funding levels) and increasing portfolio allocation to higher return assets in emerging markets for the purpose of meeting long-term obligations. Therefore, the balance sheet condition of the investor is relevant in ascertaining the hypothesis of portfolio allocations or movements of capital flows prompted by the risk-taking or the search for yield behaviour of investors. The capacity to undertake cross-border holdings will be reliant on the funding level(wealth) or funding costs for each individual firm.

However, the dataset obtained from Bloomberg albeit narrower provides a greater degree of granularity than prior studies by using disaggregated institutional investor data. The data used in this analysis consists of institutional investors asset holdings and is compiled from Bloomberg. Each institutional investor's portfolio asset holdings are collected across time. The micro-level dataset consists of asset holdings of the largest individual private institutional investors recorded in U.S. dollars. This covers individual asset positions of the largest asset managers as measured by the industry's global assets under management (AUM). The choice for inclusion of investor firms in the sample is based on the top asset management by global assets. The firms included

in the sample hold over 80% of global assets under management and represent the largest firms in the industry according to total assets under management as compiled by Investment Pensions Europe (IPE). IPE collects data on the leading 400 asset managers both globally and in the European market since 2002.

The sample covers institutional investor holdings of different assets compiled on a quarterly frequency. For each firm and quarter, the dataset contains the nominal investment in different asset classes denominated in U.S. dollars. This low frequency firm-level data allows observation of the end-quarter stock positions of different asset classes for each firm. The dataset covers salient attributes the composition of each firm's portfolio that include the firm domicile, the asset class(e.g. bonds or equity), the destination country each asset and main currency denomination of each asset. For the empirical estimation, only two asset classes (bonds and equity) are used to refer to these dimensions of disaggregation of assets within each firm portfolio. The sample period is 1999Q4 to 2016Q4, a total of 69 quarters. This covers the periods of both conventional and unconventional monetary policy implementation by the four major central banks.

**Other data sources and limitations**

The investigation into both the quantity and price rebalancing effects of monetary policy have been analysed using several sources of data with varying frequencies. One strand of the literature uses low frequency quarterly data on both gross and net capital inflows from the balance of payments data of the international monetary fund (IMF), (Ahmed, 2013; Lim and Mohapatra, 2016).

Another source of data for capital flows, specifically portfolio investment, is the Coordinated Portfolio Investment Survey (CPIS) of the IMF. The CPIS data is broadly available on annual basis and bi-annual only for the latest years. However, this dataset is not especially suitable for the analysis of the transmission of non-standard monetary policy actions considering that these policies were implemented on a more frequent basis, (MacDonald, 2017).

Alternately, evidence on the international spillover effects of monetary policies has been analysed using mutual fund data sourced from the Emerging Portfolio Fund Research(EPFR) Global database. EPFR is a commercial database which consists of higher frequency data available on a daily, weekly and monthly basis. it consists of fund flows and country allocations to various countries. With EPFR micro-level data, a deeper, albeit narrower analysis can be achieved using high frequency fund-flow data

on bond and equity mutual funds. Studies using high frequency data from the EPFR database have been carried out to examine international asset allocation, (Bonizzi, 2017), the effects of quantitative easing policies on asset flows (Fratzscher et al., 2016) and the cross-border transmission of shocks (Raddatz and Schmukler, 2012).

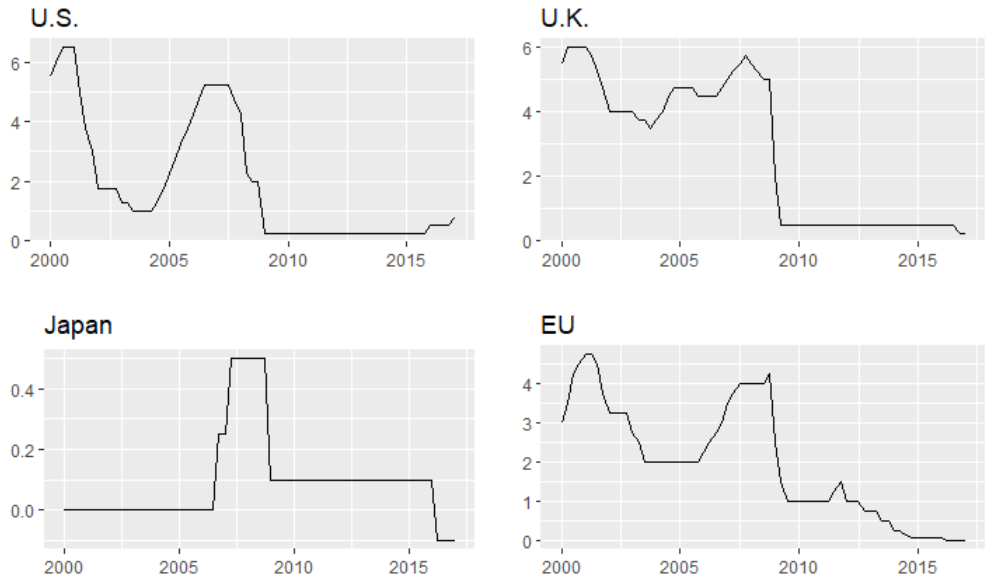
However, the EPFR database does not proxy a completely representative sample. The EPFR database constitutes only between 5% to 20% of the market capitalisation of equity and bond funds in the countries covered. Furthermore, the EPFR database only follows investment by retail and institutional investors in excess of $100,000 (Fratzscher, 2012; MacDonald, 2017). Consequently, the EPFR database has an under-representation of individual institutional investors and portray any investment by non-institutional investors, (MacDonald, 2017).

Divergent from the Balance of Payments Statistics, EPFR data captures inflows and outflows from mutual funds and exchange traded funds(ETF) and for this reason flows are not always between residents and non-residents of a given country. Additionally, the EPFR data only capture financial flows channelled through funds and do not represent total allocation, (Bonizzi, 2017). When the funding levels or solvency of the balance sheet deteriorates, the search for yield by firms with long-term liabilities such as insurance companies and pension funds will likely be more intense in a low interest rate environment. This implies that other factors such as lower levels of funding or deteriorating solvency will induce firms to reallocate to higher yielding emerging market assets, Bonizzi (2017). Additionally, another limitation is that these asset managers will have multiple funds to serve different investment objectives. These operations at fund level may not be adequately assessed using the overall firm-level data.

## Monetary policy stance measures

The analysis uses various measures of the monetary policy stance to consider the changes in monetary policy tools used by the central banks in the post-crisis period. The choice of a suitable monetary policy instrument in the post-crisis zero-lower bound period is debatable. Prior to the zero-lower bound period, the short-term policy rate serves as a measure of conventional monetary policy. The actual short-term policy rate in the four major economies is depicted in figure 3.5. Short-term policy rates in advanced economies remained low after the global financial crisis as central banks eased monetary conditions. This low interest rate environment introduces the challenge of identifying the most appropriate measure of the monetary policy stance encompassing the two periods. The spillover effects of monetary policy may be distinct in periods

Figure 3.5: Policy rates



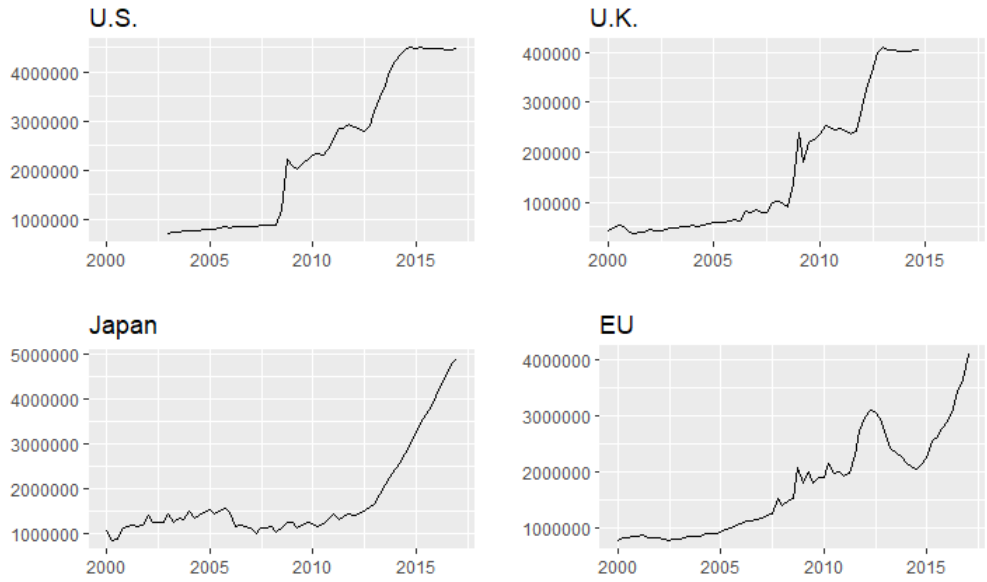

prior to the crisis, when the conventional monetary policy framework was in operation compared to the post-crisis period of unconventional monetary policy implementation. This is considering that when the short-term interest rates are at the zero-lower bound the usefulness of the short-term interest rates in transmitting meaningful information is limited.

Notwithstanding the above, the literature has provided alternative measures of the monetary policy stance that may account for the post-crisis zero-lower bound period in lieu of the actual short-term policy rate. Accordingly, various measures of the monetary policy stance in the major source economies are used to address the potential differential effects in the two policy frameworks. This is because monetary policy instruments in the unconventional period encompassed varied tools such monetary operations and forward guidance or central bank communication.

**Monetary policy operations or large-scale asset purchases**

This variable captures monetary policy operations in the form of central bank balance sheet policies. Asset purchase by the central bank are included to proxy the monetary operations and accounts for the extent of quantitative easing for each central bank. The large-scale asset purchases include Federal Reserve Bank purchases of long-term treasury assets, mortgage-backed securities (MBS) and federal agency debt (FAD) securities. Secondly, the Bank of England asset purchases as part of the Asset Purchase Facility (APF). Thirdly, the Bank of Japan buying of private-sector assets, government bill and bonds under its Asset Purchase Program (APP). Finally, the European Central

Figure 3.6: Central Bank Assets



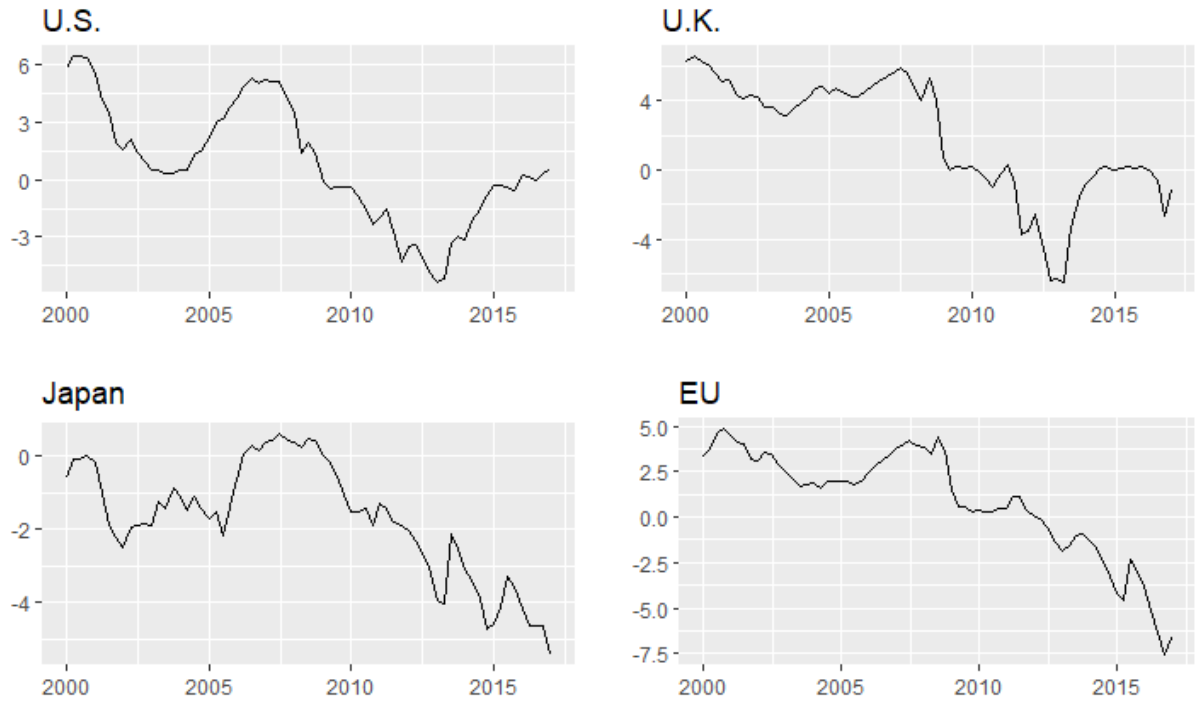

Bank purchases for the Euro area in the securities markets programme (SMP), main refinancing operations(MROs) and long-term refinancing operations(LTROs).

The large-scale asset purchases variable or monetary operations variable is measured in the baseline model as the change in the size of the central bank balance sheet. This is constructed as the change in central bank assets in percent of the nominal GDP of the respective country in which the central bank is domiciled. This is used to capture the magnitude of actual asset purchases or monetary operations comparative to the size of the economy. This proxy also accounts for the magnitude of the supply of liquidity by the monetary authorities (Buch et al., 2018). This is computed as the first difference of each central bank's assets relative to GDP. For example, for Japan, the first difference of the Bank of Japan holdings of assets divided by the nominal GDP of Japan. This change in assets by nominal GDP is constructed for all the major central banks. Figure 3.6 illustrates the expansion of the central bank balance sheets in by the four major economies across time.

### Shadow policy rate

Considering the short-term interest rates have been effectively zero in the four advanced economies over the period following the global financial crisis, it is not informative to proxy the changes in the monetary policy stance using the actual short-term interest rate. Once the path of the short-term policy hits its floor at the zero-lower bound, substitute measures of the monetary policy stance have been proposed in the literature.

Figure 3.7: Shadow policy rates




When nominal interest rates within the term structure reach the zero-lower bound, monetary policy can be proxied using a shadow policy rate. The shadow rate is derived from estimations of the term structure of interest rates. The shadow rate permits the estimation of the monetary policy stance and is beneficial because it encompasses periods of both conventional and unconventional monetary policy, (Buch et al., 2018). Consequently, the shadow rate accounts for elements of unconventional monetary policy actions and converting this into equivalent nominal interest rates when short-term rates hit floor at the zero-lower bound,(Buch et al., 2018). Therefore, the shadow interest rates account for determinants linked to both overall liquidity conditions and the effects of quantitative easing operations by the central bank on the long-term yield curve.

The analysis uses a shadow rate as a measure of the monetary policy stance similar to Buch et al. (2018) who explore the international transmission of monetary policy to bank credit to the private sector. Various estimates of shadow interest rates to account for unconventional monetary policies have been designed in the literature by Krippner (2016) and Wu and Xia (2016). The shadow rate chosen to be used in the analysis is from Krippner (2016) due to availability, data from the Wu and Xia (2016) series does not include estimates for Japan. The shadow rates from the Krippner (2016) database is comprised of shadow rates for all four major economies, the United States, the United Kingdom, Japan and the Euro area. [1] The shadow interest rate is able

[1]Data available from: https://www.rbnz.govt.nz/research-and-publications/research-programme/additional-research/measures-of-the-stance-of-united-states-monetary-policy/comparison-of-international-monetary-policy-measures

to capture the effects of quantitative easing into equivalent nominal interest rates as depicted in Figure 3.7.

### Monetary policy announcement surprises or monetary policy shocks

As conventional reduction of the short-term policy rate is limited by the effective zero-lower bound, central banks in advanced economies have engaged in the use additional non-standard measures apart from large-scale asset purchases to steer monetary policy. These measures are based on central bank communication or forward rate guidance. Forward rate guidance entails the use of central bank communication as a monetary policy tool to inform the private sector on the future path of monetary policy as well as the economic outlook. The role of the information conveyed by the central bank and the response of the private sector has been found to be important in quantifying the response of asset prices and volumes of capital flows to monetary policy. Communication channels used in forward guidance include monetary policy statements, press conferences and releases of minutes to policy meetings. The objective of forward guidance is to use these channels to convey private central bank information which is not in the information set of the public.

However, effectively conveying policy information may be problematic and require frequent and multiple information releases from the central bank to inform and update the private sector. Furthermore, the information content of a central bank announcement may be confounded by other information. Specifically, the information content or composition central bank announcements may comprise of two forms of information. First, monetary announcements relaying information about the future path of monetary policy or actual monetary policy decisions. Second, central bank announcements may alternatively convey non-monetary information pertaining to the macroeconomic outlook and economic growth as well as risk and uncertainty. Therefore, considering the emergence of central bank communication as a monetary policy tool, alternative measures to capture the monetary policy stance have been proposed in the literature to enable the analysis of the international transmission of unconventional monetary policy.

An alternate measure for the monetary policy stance during both periods of conventional and unconventional monetary policy is the instantaneous effect of monetary policy news derived from central bank announcements. This approach builds on literature on the identification of monetary policy surprises in the periods of conventional monetary policy proposed by Kuttner (2001). The premise of this technique of identification is that if markets are efficient, future prices are representative of policy rates

in the future. Therefore, the shifts in the future prices on account of a central bank policy announcement suggests that markets were surprised (Haitsma et al., 2016). Accordingly, a monetary policy surprise in the conventional policy framework can be determined as the disparity between the future rate prior to a central bank policy announcement and the policy rate announced by the central bank. However, with the short rate hitting its floor at the zero-lower bound and unconventional monetary policy being implemented, ascertaining the monetary policy stance and policy expectations is not so direct (Rogers et al., 2014). They contend that the event study framework used previously to ascertain the monetary policy surprise in the conventional framework collapses.

Therefore, the proxy used in this analysis is from Rogers et al. (2014). This monetary surprise proxy consists of the high-frequency response of the term structure of interest rates following monetary policy announcements by the central bank. These monetary policy announcements consist of communication from the central bank regarding the unconventional monetary policy strategies. The information covered in deriving this measure includes the monetary policy statements after meetings, policy speeches and other relevant events. It is proxied by the intra-day change in the benchmark government bond yield within a specified time window and accounts for the financial market effects of central bank policy announcements. It is available for all the four major economies. For example for the U.S., it is constructed as the first principal component of the change in future yields for the 2-year, 5-year, 10-year and 30-year Treasury futures assets, within a limited 30 minute window of the respective central bank policy announcement. For the UK, this is captured by the long gilt futures yield and for Japan it is measured as the change in the 10-year Japanese Government Bond (JGB) futures yields. Finally, for the European central bank (ECB) monetary policy surprises this is measured as the spread between Italian 10-year government bonds and German 10-year government bonds (Rogers et al., 2014).

The response of asset prices and volumes of cross-border financial flows to communication conveyed through central bank policy announcements underscores the importance of the *signalling channel* of monetary policy narrative. Considering this communication or information effect of monetary policy necessitates the classification of important central bank events or announcements. Subsequently, these events or announcement dates are mapped with the simultaneous high-frequency changes in benchmark government bond yields to identify a monetary shock effect. Further evidence suggests that the intensity of this monetary shock derived from announcements will vary depending on the composition of the information released by the central bank. The significance of these announcements is due to the fact that the private sector decisions are influenced by it.

Figure 3.8: US monetary policy shock

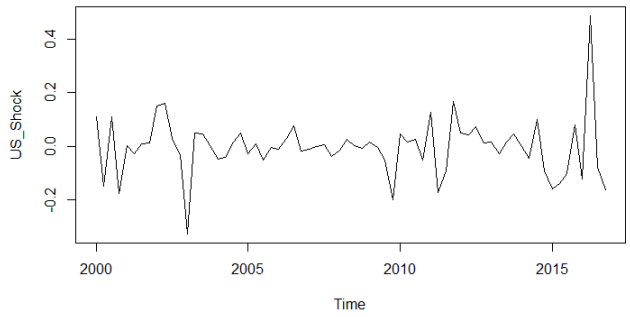



Figure 3.9: Japan monetary policy shock

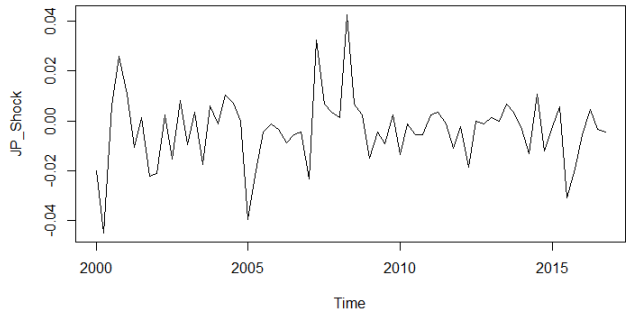



Figure 3.10: U.K. monetary policy shock

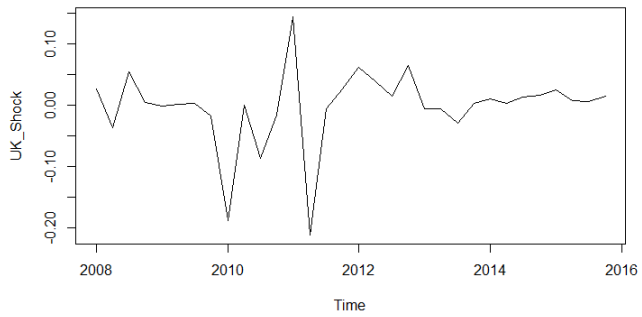
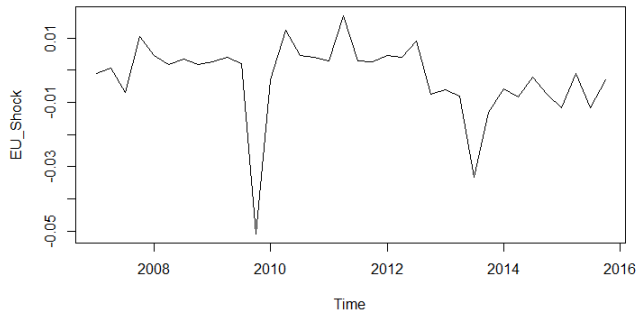



Figure 3.11: EU monetary policy shock



Therefore, the policy surprise measure considers changes in both the short-term interest rate and long-term interest rates. The underlying assumption in the construction of these announcement or surprise series is that the changes in the government bond yields within a defined 30-minute window occur solely because of the unexpected shift in the monetary policy stance. The conjecture presumes that no additional relevant economic news that would considerably alter bond yields was publicised within the defined short window on the key dates of the monetary policy announcements (Rogers et al., 2014). However, one caveat is that communication from the central bank on policy stance announcements may also be obscured by information on the monetary authority's expectations of both the present state and future path of the economy. The monetary policy shock data considering the changes in the entire term structure of interest rates are available for the Federal Reserve Bank, the Bank of England, the Bank of Japan and the European Central Bank and taken from Rogers et al. (2014).

The monetary surprise measures depicted in figure 3.8 and figure 3.9 account for changes in the long-term government bond yields in the U.S. and Japan respectively. Monetary surprises for the U.K. (figure 3.10) and the EU (figure 3.11) are also available, albeit as a shorter series covering the period after the global financial crisis. Figures 3.8-3.11 plot the time series of the four monetary policy surprises considered in this chapter to examine the effects of monetary policy by the Federal Reserve, Bank of Engalnd, European Central Bank and Bank of Japan on allocation to bonds and equities. These measures are used to consider how portfolio allocations of institutional investors respond to monetary policy surprises from four major economies' central banks and are obtained from Rogers et al. (2014). They will be used to assess how the signalling channel of monetary policy impact asset allocations of institutional investors.

## 3.5 Empirical Framework

### 3.5.1 Empirical specification

In this section, the approach used to assess the impact of unconventional monetary policy on the portfolio allocation of institutional investors is presented.

The empirical specification used to examine the relationship between monetary policy and portfolio allocation is detailed below and builds from the methodological approach of Cenedese and Elard (2018) and Raddatz and Schmukler (2012) with some adjustments due to constraints in the nature of the data being used. The effects

of central bank large-scale asset purchases and monetary policy surprises on the log weight (share) of the country or region in the portfolio of a firm in each quarter will be estimated. The initial benchmark specification estimates the effect of monetary policy on the log weight of a country or region $Y_{it}$ in the portfolio of institutional investor firm $i$ in quarter $t$ as follows:

$$Y_{it} = \alpha + \beta M_t + \lambda X_t + \varepsilon_{it} \tag{3.1}$$

Equation 3.1 will be estimated separately for each country. The variable $Y_{it}$ is the log of portfolio weight of firm $i$ in quarter $t$. $Y_{it}$ represents allocations to either a country or group of countries which include the United States (U.S.), the United Kingdom (U.K.), the European Union (E.U.), Japan, other advanced economies (OAE) and emerging market and developing economies (EM). The specification is estimated with the portfolio weight in log levels.

The variable $M_t$ measures the impact of unconventional monetary policy . This captures the monetary policy stance for the different major advanced economies. Several are measures used to account for monetary policy. First, large-scale asset purchases measured by the size of the central bank balance sheet (total assets) obtained from the four central banks and scaled by GDP in the respective economy where the central bank is domiciled. Second, the monetary policy surprise measured as the change in the intra-day benchmark government bond yields in each of the four economies. This series is obtained from Rogers et al. (2014). Third, a shadow short-term policy rate to account for monetary policy in the zero-lower bound period derived from term structure models and obtained from Krippner (2016).

The set of explanatory variables in $X_t$ comprise of the following elements. First, the returns of equities represented by the Morgan Stanley Capital international (MSCI) total return index for equities. This is described as $MSCI_{EM}$ for emerging markets and $MSCI_{WD}$ for advanced economies. Second, the $CBOE_{VIX}$ volatility index which measures the implied volatility of the Standard and Poor's 500 (S&P 500) index, this is to account for the impact of risk appetite. Third, the returns of bonds represented by the JP Morgan EMBI which tracks the hard currency bonds in emerging markets. For advanced economies an index on bonds in advanced economies $BR_{AE}$ is used from the Bank of America (BofA) Merrill lynch bond indices. The rationale for the inclusion of the return variables is to capture the returns in alternate asset classes , with advanced economies returns being representative of less risky alternative assets than riskier emerging market assets. Unlike Raddatz and Schmukler (2012) and Cenedese and Elard (2018), the data does not have the returns on each portfolio. Similarly,

following Hashem Pesaran and Smith (2016) and Cenedese and Elard (2018) push and pull factors that may respond to monetary policy are not included.[2]

### 3.5.2 Empirical strategy

The main question of this analysis is estimating the determinants of institutional investors portfolio allocations. The chapter uses a macro panel with large N and large T. The length and width of the time series permit the estimation of the long-run relationship between variables. In this chapter, institutional investors firms domiciled in 13 countries are observed over the period 1999Q4-2016Q4. Therefore, as both the cross-sectional units and time series are large, there is possibility to use heterogeneous regressions instead of the homogeneity implied in pooled regressions. Furthermore, the analysis can use time series estimators and tests to handle both non-stationarity and cointegration.[3]

#### Panel Dynamic OLS (DOLS) and Fully Modified OLS (FMOLS) Estimators

Panel time series estimators have been proposed to account for concerns of non-stationarity and cointegration in the data such as the Dynamic Ordinary Least Squares (DOLS) by Kao and Chiang (2000) and Fully Modified OLS(FMOLS) approach by Pedroni (2000). The estimator used in this analysis is the panel Dynamic OLS (DOLS) by Kao and Chiang (2000) which assumes homogeneous cointegration parameters. The estimator comprises of a co-integrating vector that restricts the long-run parameters to be homogeneous across panel units. The DOLS model controls for short-run dynamics by incorporating lags and leads of the first differences. On the basis of Monte Carlo simulations, Kao and Chiang (2000) find that the DOLS performs better than the FMOLS estimator as the FMOLS is more susceptible to small sample bias. The DOLS estimator controls for endogenous feedback through the inclusion of lead and lagged differences of the variables in the regression. The DOLS within-dimension (pooled) estimator provides unbiased and asymptotically efficient estimates of the long-run relationship of panel variables in the presence of endogenous variables.

The dynamic OLS estimator restricts long run coefficients to be the same and

[2]The portfolio selection problem for the investor will take into account risk preference, regulatory and institutional considerations. However, Hashem Pesaran and Smith (2016) suggest that the estimation of a structural model will be misspecified. As such a reduced model is implemented similar to Cenedese and Elard (2018).

[3]To acquire more precise results, the analysis includes panel unit roots tests, cointegration tests and estimation of the long run cointegrating vector. These results are detailed in section 3.A.

permits the short run coefficients and error variances to vary across the cross-sectional units. This methodology involves the estimation of the static long-run relationship supplemented by leads and lags of the first-differenced control variables.

## 3.6 Results

This section discusses the main findings on the role of institutional investors in the international transmission of monetary policy. This section describes whether and which measures of unconventional monetary policy stance by the four major central banks instigate portfolio rebalancing by institutional investors between the source country conducting monetary policy and other advanced economies and emerging market and developing countries. The results for allocation to two distinct asset classes equities and bonds are presented. For each asset class, the relationship between the portfolio weight and a distinct measure of the monetary policy stance measured as the size of the central bank balance sheet (asset purchases), monetary policy surprises and the shadow rate are used. The log of portfolio weight is regressed on a measure of monetary policy, proxies for the return of similar assets classes in advanced and emerging economies respectively and a measure of global risk sentiment.

### 3.6.1 Panel Dynamic OLS (PDOLS) Main Results

Considering the results of the panel unit root and panel cointegration tests suggests the presence of non-stationarity and cointegration (see appendix 3.A), the analysis estimates the co-integrating vector or long run relationship between portfolio weights and the various explanatory variables. The long-run relationship between firm portfolio weight, monetary policy, relative returns and global risk is estimated using the dynamic ordinary least squares (DOLS) estimator, (Kao and Chiang, 2000). The results presented are obtained by estimating the main model specification using the panel DOLS estimator to acquire the long-run parameters. The DOLS constrains the long-run coefficients to be homogeneous between panel units in the long run. The panel data cointegration analysis is conducted for 94 institutional investor firms domiciled in 13 countries is conducted using the DOLS approach.

The results show estimates of how monetary policy impacts the portfolio weights of firm $i$ in quarter $t$. The portfolio weight represents a firm's portfolio allocation to the United States (US), the United Kingdom (UK), the Euro-area (EU), Japan, other advanced economies (OAE) excluding the four advanced economies that implemented

unconventional monetary policy and emerging and developing countries (EM). This portfolio weight is expressed in log levels and regressed on variables on the monetary policy stance, relative returns of assets in advanced and emerging economies and global risk sentiment.

The results for allocation to equities are presented followed by the results for allocation to bonds. In each section, the estimates for the relationship between the portfolio weight and the different monetary policy measures used is presented. The results presented in the next section summarise the estimates for each equation estimated for each respective central bank. The full estimation of the main results presented in the next section are detailed in the appendix for allocation to equities (3.B.1) and allocations to bonds (3.B.2).

Table 3.1: Summary of results

| Proxy | Equity | | Bonds | |
|---|---|---|---|---|
| | No. of positive coefficient out of total [significant] | No. of negative coefficient out of total [significant] | No. of positive coefficient out of total [significant] | No. of negative coefficient out of total [significant] |
| Shadow policy rates | 11/20 [3] | 10/20 [3] | 10/20 [8] | 10/20 [2] |
| Asset purchases | 13/20 [5] | 7/20 [2] | 9/20 [5] | 12/20 [4] |
| Monetary policy surprises | 10/20 [3] | 6/20 [1] | 4/20 [3] | 9/20 [3] |

Notes: This table summarises results in tables 3.17 - 3.20 using asset purchases, tables 3.21 -3.24 (equities) for shadow policy rates and tables 3.25 -3.28 for monetary policy surprises. Situations are excluded in which the home country (e.g. U.S. Fed) can influence home country portfolio allocation (e.g. US)., focusing only on the impact of home country UMP (e.g. Fed) on foreign portfolio allocation (e.g. UK, EU, Japan, OAE, EM). Number of possible combinations in the denominator in ratio. Number of significant coefficients in square brackets[.]

### 3.6.2 Equities

In this section, the results of how monetary policy by four major central banks affects the allocation of institutional investor to equities are summarised. For each major central bank, the main results for equity allocations are reported for the different measures of monetary policy in table 3.2. Additional tables with full estimation results estimated separately for each central bank are detailed in the appendix 3.B. Table 3.2 provides a summary of results for each central bank using asset purchases to measure monetary policy as detailed in appendix 3.B.1.

Column (1) of table 3.2, shows how central bank asset purchases by the Fed affect equity allocation of institutional investors between the source country where the central bank is domiciled (U.S.) compared to allocation in other advanced economies and emerging markets and developing economies. In terms of the direction of rebalancing, the cross-border spillover transmission of monetary policy through asset purchases by the Federal Reserve Bank (Fed) was statistically significant for allocation in the home

Table 3.2: Asset purchases and allocation to equities (1999Q4-2016Q4)

| | U.S | U.K. | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Fed | 0.00324*** | 0.0003 | -0.0015 | 0.0140 | -0.0068** | -0.0040 |
| | (0.0007) | (0.0023) | (0.0023) | (0.0083) | (0.0023) | (0.0024) |
| BOE | 0.849** | 1.096 | 2.379*** | 3.640 | 3.555*** | 4.510*** |
| | (0.211) | (0.697) | (0.722) | (1.981) | (0.693) | (0.960) |
| ECB | -0.186 | -0.290 | 0.318 | 2.522 | 0.832 | 1.736 |
| | (0.206) | (0.678) | (0.803) | (1.743) | (0.626) | (0.900) |
| BOJ | -0.158** | 0.891*** | 0.0409 | 1.103* | 0.168 | -0.406 |
| | (0.0558) | (0.182) | (0.219) | (0.474) | (0.169) | (0.244) |

PDOLS estimation results of the effect of monetary policy on the portfolio allocation of institutional investors and employs the default setting of the xtdolshm stata command of two lags and one lead for all specifications. Specification: $lshare = M_t + CBOE_{VIX} + MSCI_{EM} + MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is the size of the central bank balance sheet scaled by the GDP in the respective economy. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

country (U.S.). Asset purchases by the Fed induced institutional investors to rebalance away from other countries and increase the portfolio weight (allocation) towards U.S. equities. This implies that U.S. monetary policy in the form of asset purchases are associated with an increase in portfolio exposure to equities in the U.S. by 0.032pp. This is contrary to the prior hypothesis that portfolio allocation by investors will induce a shift from the source country where the central bank conducting monetary policy is domiciled in search of substitute assets in other advanced economies or higher yielding assets in riskier emerging market and developing economies. Therefore, the results do not provide evidence in favour of the risk-taking channel of monetary policy.[4]

In terms of spillovers across countries and regions, of the four major economies, equity allocation to Japan increased following Fed asset purchases but was not significant. In contrast, large-scale asset purchases by the Fed induced institutional investors to rebalance away from other advanced economies (i.e. other developed economies excluding U.S., U.K, EU and Japan). This implies that the large-scale asset purchases by the Fed equivalent to 1% of US GDP is associated with an increase in the exposure to equities in other advanced economies by 0.0068pp. This is statistically significant at the 5% level. Asset purchases by the Bank of England (BOE) show evidence of

[4]The full estimation results for Fed asset purchases on allocation to equities are presented in table 3.17 in the appendix section 3.B.1.

the risk-taking channel of monetary policy. The expansion of the balance sheet by the BOE through asset purchases is associated with institutional investors increasing portfolio allocation to equities in other advanced economies (OAE) as well as emerging markets and developing countries (EM).[5] On the other hand, no significant effects are found for asset purchases conducted by the European Central Bank (ECB).[6] Finally, asset purchases by the Bank of Japan (BOJ) yielded similar results to the rebalancing effects found for the BOE. BOJ asset purchases prompted investors to increase allocation both in the source country (Japan) and in the U.K. Additionally, expansion of the central bank balance sheet by the BOJ through asset purchases prompted institutional investors to rebalance away from allocations to U.S. equities.[7]

In table 3.3, the results of how monetary policy by the four advanced economies measured by the shadow policy rate affects the portfolio allocation of institutional investors to equities is presented.[8] In column (1), the cross-border effects of monetary policy proxied by the shadow policy rate show that investors increase their portfolio allocation towards the U.S. equities when considering monetary policy of all the four major central banks (Fed, BOE, ECB, BOJ) and these effects are statistically significant. Furthermore, the results show that, there is strong evidence that monetary policy ( measured by the shadow policy rate) leads to institutional investors to reduce the weight of the portfolio allocation to U.K. equities. These effects of decreased allocation to U.K. equities are evident and statistically significant for all the major central banks (Fed, BOE, ECB, BoJ). The strongest effect is for the BOJ shadow policy rate which is associated with a lower portfolio exposure to U.K. equities. In terms of the overall evidence of the direction of rebalancing, there is no evidence of a risk-taking channel of monetary policy or investors increasing the portfolio weight to allocation to riskier emerging markets and developing countries when the shadow policy rate is used to proxy the monetary policy stance.

[5]Full estimation results for BOE asset purchases on allocation to equities are presented in table 3.18 in the appendix section.

[6]Full estimation results for ECB asset purchases on allocation to equities are presented in table 3.18 in the appendix section.

[7]Full estimation results for BOJ asset purchases on allocation to equities are presented in table 3.20 in the appendix section.

[8]Full results for the shadow policy rate are presented in tables 3.21 - 3.24

Table 3.3: Shadow policy rate and allocation to equities (1999Q4-2016Q4)

| | U.S | U.K. | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Fed | 0.0254** | -0.0766* | 0.0387 | -0.123 | -0.0287 | 0.0284 |
| | (0.0093) | (0.030) | (0.0366) | (0.0790) | (0.0283) | (0.0408) |
| BOE | 0.0259** | -0.0672* | 0.0560 | 0.0910 | 0.0278 | 0.0086 |
| | (0.0080) | (0.0262) | (0.0313) | (0.0680) | (0.02444) | (0.0353) |
| ECB | 0.0291** | -0.0832** | -0.0386 | 0.0313 | -0.0490 | -0.0523 |
| | (0.0097) | (0.0318) | (0.0384) | (0.00834) | (0.0293) | (0.0422) |
| BOJ | 0.0487*** | -0.146** | -0.0680 | 0.123 | -0.0760 | -0.0171 |
| | (0.0146) | (0.0471) | (0.0573) | (0.124) | (0.00441) | (0.0642) |

PDOLS estimation results of the effect of monetary policy on the portfolio allocation of institutional investors and employs the default setting of the xtdolshm stata command of two lags and one lead for all specifications. Specification: *lshare* =Shadow rate + $CBOE_{VIX}$ + $MSCI_{EM}$ + $MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or lshare. $M_t$ is the shadow policy rate. Standard errors in parentheses. Levels of significance: * p<0.1, ** p<0.05, *** p<0.01

### 3.6.3 Bonds

Table 3.4 summarises the results for how monetary policy by the the four major central banks measured by asset purchases affects the allocation of institutional investors to bonds.[9] Table 3.4 shows that Fed asset purchases led to a rebalancing away from bonds in other advanced economies. Expansion of the Fed's balance sheet prompted a reduction of 0.018pp which is statistically significant at the 1% level. This finding is similar to that obtained for equities in table 3.2 where institutional investors shifted allocation away from equities of other advanced economies (OAE) following Fed asset purchases. BOE expansion of the balance sheet through asset purchases leads institutional investors to increase their portfolio exposure to bonds in the U.K. and is statistically significant at the 1% level. ECB asset purchases have no effect on allocation to Japan bonds. ECB asset purchases induce investors to rebalance away from equities in the U.K. and increase their portfolio weight of bonds in other advanced economies (OAE) and emerging markets (EM). This provides support for the hypothesis that investors will shift allocation from the source country conducting monetary policy to other advanced economies (OAE) in search of substitute assets. The ECB result, further lends support to the hypothesis that investors may engage in risk-taking by shifting allocation away from the source country implementing monetary policy and rebalance towards riskier emerging markets (EM) in search of higher yields. For BOJ asset purchases,

[9]The full estimation results for the effects of asset purchases by each central bank in relation to portfolio allocation to bonds is detailed in (3.B.2) of the appendix on tables 3.29 - 3.32

Table 3.4: Asset purchases and allocation to bonds (1999Q4-2016Q4)

| | U.S | U.K. | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Fed | 0.00883 | -0.0011 | -0.0023 | -0.00822 | -0.0179*** | -0.0168 |
| | (0.0063) | (0.0006) | (0.0051) | (0.112) | (0.0039) | (0.0108) |
| BOE | 0.420 | 1.245*** | -0.416 | 0.000 | -4.676 | -3.290 |
| | (1.238) | (0.151) | (1.060) | (26.34) | (5.504) | (2.905) |
| ECB | -1.430 | -0.280** | 1,436 | 0 | 2.522*** | 7.512** |
| | (0.1031) | (0.0910) | (0.829) | (10.70) | (0.514) | (2.441) |
| BOJ | -0.966*** | 0.359*** | -1.763*** | 25.41*** | 1.905*** | 1.902** |
| | (0.268) | (0.0407) | (0.196) | (4.737) | (0.412) | (0.673) |

PDOLS estimation results of the effect of monetary policy on the portfolio allocation of institutional investors and employs the default setting of the xtdolshm stata command of two lags and one lead for all specifications. Specification: lshare = $M_{it} + CBOE_{VIX} + MSCI_{EM} + MSCI_{WD}$. The dependent variable is log portfolio weight to bonds $Y_{it}$ or lshare.$M_t$ is the size of the central bank balance sheet scaled by the GDP in the respective economy. Standard errors in parentheses. Levels of significance: * p <0.1, ** p <0.05, *** p <0.01

the results show that institutional investors lower the portfolio weight of U.S. and E.U. bonds and increase allocation at home (Japan), other advanced economies (OAE) and emerging markets (EM).

Table 3.5 summarises the results of how monetary policy measured by the shadow policy rate of each central bank impacts institutional investor allocation to bonds.[10] Following Fed monetary policy stimulus measured by the shadow rate, the results show that the portfolio weight towards bond allocation to other advanced economies (OAE) increased whereas allocation to bonds in Japan declined. In response to the BOE shadow policy rate, institutional investors increase bond portfolio weight to Japan, other advanced economies and emerging markets (EM). There is evidence of the risk-taking channel. For the shadow policy rate of the ECB, bond allocations increase to the U.S., E.U. and Japan. Whereas for BOJ shadow policy rate, there is evidence of an increase in portfolio weights or bond allocations to the US., E.U. and other advanced economies (OAE).

The results for the shadow rate of the Fed suggest that institutional investors re-balance towards bonds in other advanced economies. The BOE shadow policy rate

[10]The full estimation results for the effects of the shadow policy rate of each central bank in relation to portfolio allocation to bonds is detailed in (3.B.2) of the appendix on tables 3.21 - 3.24

Table 3.5: Shadow policy rate and allocation to bonds (1999Q4-2016Q4)

| | U.S | U.K. | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Fed | 0.0046 | -0.0009 | -0.00782 | -1.089* | 0.0862** | 0.125 |
| | (0.0312) | (0.0048) | (0.0030) | (0.510) | (0.0311) | (0.0839) |
| BOE | -0.0490 | -0.0036 | -0.0354 | 2.727*** | 0.0917*** | 0.163* |
| | (0.0352) | (0.0042) | (0.0289) | (0.216) | (0.0124) | (0.0816) |
| ECB | 0.268*** | -0.0074 | 0.150*** | 2.113*** | -0.0397 | -0.109 |
| | (0.0381) | (0.0054) | (0.0318) | (0.382) | (0.0585) | (0.135) |
| BOJ | 0.254*** | -0.0172 | 0.207*** | 2.114* | _0.325∗ | 0.0175 |
| | (0.0668) | (0.0101) | (0.0395) | (0.650) | (0.124) | (0.180) |

PDOLS estimation results of the effect of monetary policy on the portfolio allocation of institutional investors and employs the default setting of the xtdolshm stata command of two lags and one lead for all specifications. Specification: $lshare = M_{it} + CBOE_{VIX} + MSCI_{EM} + MSCI_{WD}$. The dependent variable is log portfolio weight to bonds $Y_{it}$ or lshare. $M_{it}$ is the shadow policy rate. Standard errors in parentheses. Levels of significance: *p<0.1, ** p <0.05, *** p <0.01

results suggest increased bond portfolio exposure to Japan, other advanced economies and emerging markets. The ECB shadow rate is associated with an increase in the exposure of investor's portfolios to bonds in advanced economies, namely the U.S., the EU, and Japan. Finally, the BOJ shadow policy rate indicates that monetary policy will push away institutional investors to the home country, the E.U. and the U.S. Furthermore, the Bank of Japan shadow rate has a negative significant effect on other developed countries.

In summary, the analysis finds evidence for portfolio rebalancing towards substitute advanced economies and riskier markets. This is similar to findings by Fratzscher et al. (2016) and Cenedese and Elard (2018). However, the analysis further finds evidence contrary to the hypothesis that, investors will rebalance away from the source country conducting monetary policy. The analysis finds that investors increase allocation towards the home country. This is the case for Federal Reserve Bank and BOJ asset purchases and equity allocation and BOE asset purchases and allocation to bonds.

In terms the proxy of monetary policy used and the comparative magnitude of the spillover effects, asset purchases generate a larger effect in comparison to the shadow policy rate. This is similar to findings by Buch et al. (2018) and emerging evidence that demonstrates that the shadow measure of the monetary policy stance is more potent

in identifying the international transmission of monetary policy particularly in periods of unconventional monetary policy implementation. This highlights the nature of the relationship of between monetary policy and portfolio allocation when the central bank policy rate moves to the zero-lower bound.

### 3.6.4 Cross-border transmission of monetary policy and the crisis

This section focuses on whether the evidence of the cross-border transmission of monetary policy changes in the sub-period following the global financial crisis. To further investigate this, the regressions are re-estimated in the post-crisis period. The period from 20008Q4 onward is considered as the date to split the sample. The replication of the previous analysis using the shadow policy rate and large-scale asset purchases to capture the monetary policy stance are presented.

#### Shadow policy rate post-crisis period

In table 3.6 results of the transmission of monetary policy for a shorter post-crisis sub-period indicates that overall, U.S. monetary policy induced an increase in allocation to equities. Column (3) shows that monetary policy by the Fed captured by the shadow rate triggered institutional investors to lower allocation to equities in the U.K. For allocations to the U.K., the effect associated with U.S. monetary policy continues to be negative. This reinforces prior results obtained for the whole sample in table 3.3. There is a rebalancing away from the U.K. in response to monetary policy by the Fed and a shift toward an increase in allocation to equities to the U.S. (home). Although, equity allocation is found to increase in the U.S. (home) following Fed monetary policy, this effect is insignificant compared to the results reported in the previous section (table 3.3 )for the entire sample period. In terms of the direction of rebalancing across the major countries and regions, the results for the shorter time period offer distinct results. The shadow policy rate induces institutional investors to increase allocation to other advanced economies (developed countries excluding the four major advanced economies) and is statistically significant at the 5% level. The results also suggest support for the proposition of an increase in allocation to substitute assets other than the source country of the central bank conducting unconventional monetary policy (the Fed). In this case, the shadow policy rate of the U.S. is associated with an increase in portfolio exposure to other advanced economies (OAE) and to the the Euro area by 0.056pp and 0.09pp respectively. Furthermore, estimates in column (7) provides

evidence of the risk-taking channel, allocation to riskier assets in emerging markets and developing countries (EM) is significant at the 5% level. This suggests that there is a role for institutional investors in the cross-border transmission of monetary policy conducted by advanced economies. Table 3.6.4 shows the results for the pre-crisis period.

Table 3.6: Shadow policy rate and allocation to equities (2008Q4 -2016Q4)

| | Equity | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Fed | 0.0301*** | 0.00125 | -0.0613** | 0.0946*** | 0.0766 | 0.0559** | 0.0487** |
| | (0.0103) | (0.00800) | (0.0282) | (0.0271) | (0.0574) | (0.0263) | (0.0236) |
| $CBOE_{VIX}$ | 0.00319 | 0.000845 | 0.0156** | -0.00551 | -0.000602 | 0.0160** | -0.00684 |
| | (0.00251) | (0.00194) | (0.00684) | (0.00658) | (0.0139) | (0.00639) | (0.00573) |
| $MSCI_{EM}$ | 0.000108 | -0.0000187 | -0.00114*** | 0.0000728 | 0.00175** | 0.00124*** | -0.0000186 |
| | (0.000132) | (0.000102) | (0.000359) | (0.000344) | (0.000731) | (0.000335) | (0.000300) |
| $MSCI_{WD}$ | -0.0000134 | -0.000111 | 0.00160*** | -0.000597* | -0.00176** | 0.000264 | -0.000557* |
| | (0.000127) | (0.0000978) | (0.000344) | (0.000331) | (0.000702) | (0.000321) | (0.000288) |
| N | 7134.00 | 1624.00 | 1218.00 | 1305.00 | 348.00 | 1218.00 | 1421.00 |
| $R^2$ | 0.00 | 0.03 | 0.08 | 0.02 | 0.18 | 0.02 | 0.01 |

Specification: *lshare*= $M_{it}$ + $CBOE_{VIX}$+ $MSCI_{EM}$ + $MSCI_{WD}$. The dependent variable is log portfolio weight to equities $Y_{it}$ or lshare. $M_{it}$ is the shadow policy rate. Standard errors in parentheses. Levels of significance: *p<0.1, ** p <0.05, *** p <0.01

**Large-scale asset purchases post-crisis period**

In table 3.8, results using the large-scale asset purchases for the shorter sub-period reinforce the prior evidence of the direction of rebalancing. Column (1) shows the results for the overall allocation to equities. Column (2) shows a statistically significant increase in allocation to assets at home is found following the Federal Reserve Bank large-scale asset purchases at the 5% level. Large-scale asset purchases by the Federal Reserve Bank equivalent to 1% of US GDP leads institutional investors to increase their portfolio exposure to equities at home by 0.003pp. In terms of the spillovers across major economies and regions, there are similar findings and larger effects for allocation to other advanced economies (OAE) only. Large-scale asset purchases of the Fed prompted institutional investors to rebalance away from other advanced economies and the effects are significant at the 5% level. Table3.6.4 shows the results for the impact of size of the central bank balance sheet in the pre-crisis period of 1999Q4-2008Q3. Therefore, splitting the sample period into two periods encompassing the

Table 3.7: Shadow policy rate and allocation to equities (1999Q4 -2008Q3)

| | Equity | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Fed | 0.0739*** | -0.00856 | 0.116 | 0.141** | 0.161* | 0.00880 | 0.173* |
| | (0.0271) | (0.0210) | (0.0769) | (0.0695) | (0.0964) | (0.0612) | (0.0887) |
| $CBOE_{VIX}$ | -0.00887** | -0.00135 | 0.00393 | -0.00117 | -0.0212 | -0.0245*** | -0.0217 |
| | (0.00421) | (0.00326) | (0.0120) | (0.0108) | (0.0150) | (0.00951) | (0.0138) |
| $MSCI_{EM}$ | 0.00137*** | -0.000470* | 0.000403 | 0.00234*** | 0.00423*** | 0.00102 | 0.00432*** |
| | (0.000348) | (0.000270) | (0.000990) | (0.000895) | (0.00124) | (0.000787) | (0.00114) |
| $MSCI_{WD}$ | -0.00144*** | 0.000304 | -0.00127 | -0.00222** | -0.00506*** | -0.000879 | -0.00344** |
| | (0.000426) | (0.000330) | (0.00121) | (0.00109) | (0.00152) | (0.000963) | (0.00140) |
| N | 2240.00 | 704.00 | 320.00 | 352.00 | 160.00 | 384.00 | 320.00 |
| $R^2$ | 0.04 | 0.09 | 0.05 | 0.11 | 0.36 | 0.11 | 0.30 |

Specification: $lshare = M_t + CBOE_{VIX} + MSCI_{EM} + MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is the shadow policy rate. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

period prior to the global financial crisis and afterwards suggests that the cross-border transmission of monetary policy exerted a greater effect of investors rebalancing away from other advanced economies in the period following the post-crisis period.

In summary, comparing the results for the post-crisis period to the entire sample period yields small economic effects but results in allocation to the U.S. and the U.K. of similar magnitudes. The shadow rate reinforces the evidence of rebalancing away from the UK. Whereas, results using large-scale asset purchases as a proxy for monetary policy reinforces findings found for the entire period, of institutional investors rebalancing towards equities at home with similar magnitudes. Therefore, the empirical analysis suggests that there are cross-border spillovers for U.S. monetary policy. However, the mechanisms through which these spillover affect allocations across countries and regions varies depending on the time period under assessment and monetary policy stance measure used.

### 3.6.5 Robustness

This section presents the robustness checks to assess whether the results obtained for the main specification remain the same. The effects of solely the U.S. monetary policy are examined using alternative measures of the monetary policy stance as controls.

Table 3.8: Large-scale asset purchases and allocation to equities (2008Q4 -2016Q4)

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | Equity (All) | US | UK | EU | Japan | OAE | EM |
| Fed | -0.000992 | 0.00307** | 0.000241 | 0.00595 | -0.00656 | -0.0108** | -0.00327 |
| | (0.00183) | (0.00141) | (0.00497) | (0.00478) | (0.0101) | (0.00464) | (0.00416) |
| $CBOE_{VIX}$ | 0.00220 | 0.00352* | 0.00486 | 0.00433 | 0.00571 | 0.00570 | -0.00738 |
| | (0.00251) | (0.00194) | (0.00682) | (0.00656) | (0.0139) | (0.00637) | (0.00571) |
| $MSCI_{EM}$ | -0.000144 | -0.0000482 | -0.000707* | -0.000768** | 0.00145* | 0.000736** | -0.000342 |
| | (0.000136) | (0.000105) | (0.000369) | (0.000355) | (0.000753) | (0.000344) | (0.000309) |
| $MSCI_{WD}$ | 0.0000937 | -0.0000112 | 0.000905*** | 0.0000692 | -0.00128** | 0.000288 | -0.000289 |
| | (0.000113) | (0.0000874) | (0.000307) | (0.000296) | (0.000627) | (0.000287) | (0.000257) |
| N | 7134.00 | 1624.00 | 1218.00 | 1305.00 | 348.00 | 1218.00 | 1421.00 |
| $R^2$ | 0.00 | 0.03 | 0.08 | 0.01 | 0.18 | 0.02 | 0.01 |

Specification: $lshare = M_t + CBOE_{VIX} + MSCI_{EM} + MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is the size of the central bank balance sheet scaled by the GDP of the respective economy. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.9: Large-scale asset purchases and allocation to equities (1999Q4 -2008Q3)

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | Equity (All) | US | UK | EU | Japan | OAE | EM |
| Fed | -0.0790*** | 0.0344*** | -0.164*** | 0.00237 | -0.121*** | -0.0141*** | -0.257*** |
| | (0.00164) | (0.00118) | (0.00394) | (0.00366) | (0.00774) | (0.00438) | (0.00415) |
| CBOEVIX | 0.0376*** | -0.0144*** | 0.0465*** | 0.0201 | 0.0512* | -0.00149 | 0.138*** |
| | (0.00657) | (0.00472) | (0.0158) | (0.0147) | (0.0310) | (0.0176) | (0.0166) |
| MSCI_EM | -0.00640*** | 0.00272*** | -0.0112*** | -0.00395*** | -0.00809*** | -0.00196* | -0.0186*** |
| | (0.000396) | (0.000285) | (0.000953) | (0.000886) | (0.00187) | (0.00106) | (0.00100) |
| MSCI_WD | 0.00641*** | -0.00247*** | 0.00972*** | 0.00504*** | 0.00761*** | 0.00286** | 0.0180*** |
| | (0.000473) | (0.000340) | (0.00114) | (0.00106) | (0.00223) | (0.00126) | (0.00120) |
| N | 3800.00 | 855.00 | 646.00 | 665.00 | 209.00 | 684.00 | 741.00 |
| $R^2$ | 0.05 | 0.10 | 0.02 | 0.12 | 0.03 | 0.08 | 0.24 |

Specification: $lshare = M_t + CBOE_{VIX} + MSCI_{EM} + MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is the size of the central bank balance sheet scaled by the GDP of the respective economy. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

This is done by measuring the Federal Reserve Bank asset purchases expressed as a percentage of total debt assets outstanding. This accounts for the extent of asset scarcity created following central bank asset purchases similar to the robustness in Cenedese and Elard (2018).

Table 3.10 shows the varied results obtained using central banks as a percentage of total debt yields. Investors rebalance away from equity overall. Secondly, U.S. monetary policy prompts investors to rebalance towards equities at home and away from the E.U. and other advanced economies.

Table 3.12 introduces different episodes of quantitative easing included as binary variables. This simple binary approach to consider unconventional monetary policy using dummies for central bank actions has been used in prior literature (Rose, 2018; Lim and Mohapatra, 2016; Bua and Dunne, 2017; Khatiwada, 2017). The coding scheme used for the dates are based on identified key quarterly dates related to U.S. quantitative easing policies taken from Rose (2018) and detailed in table 3.11. There are statistically significant effects for allocations to equities in the U.S. following the implementation of QE1 and QE2. In contrast, the first and second wave of quantitative easing by the Federal Reserve Bank prompted investors to rebalance away from equities in the U.K. and other advanced economies. This is similar to findings of the large-scale asset purchases expressed as a percentage of GDP in the post-crisis period.

Table 3.10: Central Bank Assets as percentage of total outstanding debt and allocation to equities (2008Q4 -2016Q4)

| | Equity (All) | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Debt | -3.477*** | 3.779*** | -3.941 | -5.475* | -0.0420 | -14.47*** | -0.952 |
| | (1.165) | (0.901) | (3.171) | (3.046) | (6.478) | (2.959) | (2.655) |
| CBOEVIX | 0.00811*** | -0.00337 | 0.00964 | 0.0102 | -0.00175 | 0.0319*** | -0.0000110 |
| | (0.00296) | (0.00229) | (0.00806) | (0.00774) | (0.0165) | (0.00752) | (0.00675) |
| MSCI_EM | -0.000115 | 0.0000233 | -0.000820** | -0.000568* | 0.00145** | 0.000571* | -0.000223 |
| | (0.000130) | (0.000101) | (0.000355) | (0.000341) | (0.000724) | (0.000331) | (0.000297) |
| MSCI_WD | 0.000582*** | -0.000534*** | 0.00140*** | 0.000807 | -0.00132 | 0.00231*** | -0.0000670 |
| | (0.000198) | (0.000153) | (0.000540) | (0.000518) | (0.00110) | (0.000504) | (0.000452) |
| N | 7134.00 | 1624.00 | 1218.00 | 1305.00 | 348.00 | 1218.00 | 1421.00 |
| $R^2$ | 0.00 | 0.03 | 0.08 | 0.01 | 0.18 | 0.02 | 0.01 |

Specification: $lshare = M_t + CBOE_{VIX} + MSCI_{EM} + MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is *Debt* defined as is central bank assets as percentage of total outstanding debt. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.11: Key dates for unconventional monetary policies

| | Quantitative Easing | Negative Nominal Interest Rates |
|---|---|---|
| US, QE1 | 2008Q4-2010Q1 | |
| US, QE2 | 2010Q4-2011Q2 | |
| US, QE3 | 2012Q3-2014Q4 | |
| UK, QE1 | 2009Q1-2010Q1 | |
| UK, QE1 | 2009Q1-2010Q1 | |
| Japan | 2001Q1-2006Q1 | |
| Japan | 2010Q4- | 2016Q1- |
| EMU,CBBP | 2009Q3-2010Q2 | |
| EMU,SMP | 2010Q2-2012Q3 | |
| EMU,CBBP2 | 2011Q4-2012Q4 | |
| EMU,ABSPP,CBBP3 | 2014Q4- | |
| EMU,PSPP | 2015Q1- | 2014Q2- |
| Switzerland | | 2011Q3- |
| Denmark | | 2012Q3- |
| Sweden | | 2015Q1- |

Source Rose (2018). Dates for quantitative easing (QE) programs and nominal negative interest rates (NNIR) in advanced economies.

Table 3.12: Quantitative easing episodes allocation to equities (2008Q4 -2016Q4)

| | Equity (All) | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| $US_{QE_1}$ | -0.0445 | 0.148*** | -0.305** | 0.0101 | 0.278 | -0.394*** | 0.130 |
| | (0.0566) | (0.0437) | (0.154) | (0.148) | (0.314) | (0.144) | (0.129) |
| $US_{QE_2}$ | 0.137** | -0.106** | -0.308** | 0.693*** | 1.153*** | 0.365*** | -0.157 |
| | (0.0534) | (0.0412) | (0.145) | (0.140) | (0.296) | (0.136) | (0.122) |
| $US_{QE_3}$ | -0.0797** | -0.00417 | -0.154* | -0.00574 | -0.0963 | -0.0890 | -0.158** |
| | (0.0330) | (0.0255) | (0.0899) | (0.0863) | (0.183) | (0.0838) | (0.0752) |
| $CBOE_{VIX}$ | 0.00200 | 0.00550** | -0.0153** | 0.0178** | 0.0534*** | -0.00503 | -0.00823 |
| | (0.00280) | (0.00216) | (0.00763) | (0.00732) | (0.0156) | (0.00711) | (0.00639) |
| $MSCI_{EM}$ | -0.0000129 | 0.000211* | -0.000360 | -0.00176*** | -0.000263 | 0.000808** | 0.000996*** |
| | (0.000157) | (0.000121) | (0.000428) | (0.000411) | (0.000872) | (0.000399) | (0.000358) |
| $MSCI_{WD}$ | 0.000307*** | -0.0000269 | 0.000501 | 0.000467 | -0.000438 | 0.000787*** | 0.000147 |
| | (0.000119) | (0.0000917) | (0.000323) | (0.000310) | (0.000659) | (0.000301) | (0.000271) |
| N | 7134.00 | 1624.00 | 1218.00 | 1305.00 | 348.00 | 1218.00 | 1421.00 |
| $R^2$ | 0.00 | 0.04 | 0.08 | 0.02 | 0.18 | 0.03 | 0.01 |

Specification: $lshare = M_t + CBOE_{VIX} + MSCI_{EM} + MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is *QE* episode as defined by the key dates for unconventional monetary policies. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

## 3.7 Conclusion

This chapter analyses the international spillovers effects of monetary policy by advanced economies on portfolio investment allocation behaviour. The chapter focuses mainly on the reallocation of assets by financial intermediaries, to the degree this is the avenue through which monetary policy is transmitted across borders. The focus is on the response of institutional investors to changes in monetary policy using micro-level data of 94 firms domiciled in 13 countries. The research distinguishes between two policy regimes, periods of conventional and unconventional monetary policy to further analyse the relation between central bank monetary policy actions and financial intermediaries' portfolio allocation. Using the investor asset allocation data, the research makes several findings on the transmission of monetary policy. The chapter finds evidence of significant and heterogeneous spillovers across non-bank financial intermediaries and periods prior to the crisis or conventional monetary policy and the post-crisis period of unconventional monetary policy.

First, the international transmission of took place through global institutional investors. The results suggest that monetary policy prompted rebalancing into equity allocations, with institutional investors increasing allocation particularly to US equities.

Second, the results show that the international transmission effect of monetary policy is present and heterogeneous in the period prior to the global financial crisis when conventional monetary policy was implemented and in the post-crisis period of unconventional monetary policy implementation.

Third, among the proxies of the monetary policy stance used to identify the cross-border spillovers of monetary policy, the shadow policy rate reveals more significant effects. These significant effects from the shadow policy rate are exhibited both in the overall sample period and in the post-crisis period compared to the size of the central bank balance sheet as a proxy of the monetary policy stance. This lends further support to evidence from prior literature on the capacity of the shadow policy short rate as a viable alternate measure that can be used to effectively capture monetary policy across periods of both conventional and unconventional monetary policy. It has been suggested that this could be on account of large-scale asset purchases proxied by the size of the central bank balance sheet omitting information content from central bank communication such as forward guidance, (Buch et al., 2018).

Fourth, the cross-border spillovers of monetary policy dissimilar across the source countries. Transmission of monetary policies from other advanced economies (the U.K.

and Japan) other than the largest, the U.S., yields statistically significant effects. Therefore, the transmission of monetary spillovers from the Non-US central banks is relevant for into portfolio allocation activity of institutional investors.

Fifth, evidence of cross-border exposure to assets in other advanced economies and emerging markets and developing economies is found. However, the pattern of the geographical allocation to other countries other than the source country conducting monetary policy is not as hypothesised. There is evidence of rebalancing towards the source country particularly for U.S. equity assets. Furthermore, the results suggest support for the risk-taking channel of monetary policy. Institutional investors respond to monetary policy by rebalancing toward riskier emerging market and developing economies. This suggests institutional investors have a role in the international transmission of monetary policy. This offers support for the challenges policymakers in small and open economies encounter due to changing financial conditions in major systemic economies and capital flow surges. Principally, the evidence of this analysis provides support for the economically significant link between the monetary policy actions of large systemic economies to financial intermediaries' portfolio allocation. The expansionary monetary policies induce institutional investors to undertake more risk and rebalance to other economies.

The chapter contributes to the empirical literature by demonstrating that the international transmission of monetary policy is varied in periods of conventional and unconventional monetary policy. The relationship between monetary policy and financial markets is crucial on both macroeconomic and microeconomic fronts. A better comprehension of the cross-border spillover effects of monetary policies implemented by advanced economies will have implications for financial stability for other economies, particularly small and open economies. On the microeconomic front, a better comprehension of the response of different economic agents (firms, households and financial intermediaries) to changes in the monetary policy stance may affect credit growth, asst prices and capital flows. In particular, this research focuses on how one specific group of financial intermediaries; institutional investors, responds to the monetary policies in advanced economies. Understanding the response of financial market participants is a crucial to connecting the changes in asset prices and financial flows to the monetary policy actions of large systemic economies. A better comprehension of this relationship is beneficial for policy makers to acquire more knowledge distinguishing various the transmission mechanisms and effects of monetary policy stimulus. Whereas, for agents in the financial markets, more accurate determination of the response of asset prices and financial flows to the monetary policy stance will be beneficial in devising suitable investment choices. The approach of the analysis has some notable limitations. It does not consider firm-specific characteristics related to balance sheet variables as

additional sources of heterogeneity in the cross-border transmission of monetary policy. The lack of identification of the idiosyncratic frictions institutional investors face does not permit further distinction that spillovers across firms may be varied. These firm-level characteristics may also vary in importance in periods of conventional and unconventional monetary policy.

The results have implications for policy makers. The monetary policy stance of advanced economies' is important for cross-border portfolio allocation decisions of financial intermediaries. This relates the investment allocation behaviour or choices by institutional investors to cross-border capital inflows received by emerging and developing economies in the post-crisis period. Both the effects of these policies were varied across the global financial cycle and the transmission mechanism channels for the central bank policy actions were distinct. Therefore, capital inflows as a result of policy actions in systemic economies will necessitate vigilance in building up tools to bolster resilience to external shocks by policy makers in emerging and developing economies.

Although the magnitude of the effect and the economic significance is small, there is support for the role of institutional investors in the surge in capital flows to emerging market and developing economies unlike Cenedese and Elard (2018) who find insignificant effects for the risk-taking channel of the cross-border transmission of monetary policy. Additionally, there is more evidence of investors rebalancing toward other developed economies other than the source country conducting monetary policy. This is similar to Cenedese and Elard (2018).

The role of systemic economies monetary policies and financial instability, in the unconventional monetary policy period specifically. Additionally, following the low interest rate environment and the increased demand for emerging market and developing economies assets, the role of institutional investors can be investigated further. Focusing on the portfolio investment in sovereign and corporate assets in emerging and developing countries by institutional investors would be beneficial in assessing the potential financial stability risks that may ensue due to balance sheet vulnerability to external financial conditions.

# 3.A Appendix

## 3.A.1 Panel-unit root tests

Panel unit root tests can be classified as first-generation or second-generation tests. In this section the panel unit root tests are used to determine the order of integration of the variables. Non-stationary series may cause spurious regression results. The hypothesis of the unit rot tests was tested using Fisher-type panel unit root tests to check if the logarithmic portfolio weight in levels is non-stationary. The advantage of the Fisher-type panel unit root tests is that they can be used with unbalanced panels as is the case of the sample of institutional investor firms. Fisher-type tests do not require strongly balanced data and series can have gaps unlike the panel unit root test by Im et al. (2003) which requires no gaps in the series. Within the Fisher-type tests the analysis implements the Phillips-Perron test rather than the Augmented Dickey Fuller to acquire tests more robust to serial correlation and using a heteroskedasticity and autocorrelation consistent estimator. The Phillips-Perron test uses Newey-West standard errors taking serial correlation into consideration. The augmented Dickey-Fuller implements the panel unit root test by using lagged values of the first differenced variable in the regression.

The null hypothesis of the test is that the panels have unit roots against the alternative hypothesis that some panels are stationary. The panel unit root tests include 4 Newey-West lags. The Z-statistic and p-value results for each group are presented in table 3.13. The panel unit root tests are applied to the unbalanced panel dataset and strongly rejects the null hypothesis that the series has non-stationarity or all panels contain unit roots. This suggests that at least one of the panel units is stationary or at least one institutional investor firm's portfolio weight in log levels is stationary. The rejection of the null hypothesis permits the assumption that all portfolio weight in log levels are stationary. Table 3.13 presents the Fisher unit-root test on the log portfolio weight for equities. Since we reject the null hypothesis, some non-stationarity needs to be addressed. Therefore, there is need to find some linear combination that produces stationary error terms.

Table 3.13: Panel Unit Root Tests for Institutional Investor Firms-(1999Q4-2016Q4)

| | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| Demean/trend (no/no) | -7.4551 | -10.8841 | -13.8668 | -3.1041 | -8.8847 | -9.3987 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| Demean/trend (yes/yes) | -12.6265 | -11.1668 | -13.7568 | -3.1032 | -11.5110 | -11.5689 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0010) | (0.0000) | (0.0000) |
| Number of panels | 76 | 62 | 68 | 26 | 65 | 69 |
| Average number of periods | 55.70 | 53.66 | 52.97 | 47.92 | 54.11 | 54.78 |

The Z statistic is reported and p values in parentheses. The null hypothesis is all series are non-stationary or all panels contain unit roots. The series are demeaned and allow for deterministic trends and constants.

### 3.A.2 Panel cointegration tests

Cointegration among the variables will be tested using the seven-test statistic proposed by (Pedroni, 1999, 2004). Panel cointegration tests seek to provide more stable results by testing for the existence of cointegration. This is to ascertain whether cointegration techniques will be suitable. These test statistics for the cointegration tests consist of two approaches. One type is the group-mean statistics which average the results of individual test statistics. The second type are the panel statistics which pool together statistics on within-dimension. These pooled or within-dimension tests assume a common process or homogeneity of the autoregressive term. Whereas the grouped or between-dimension tests assumes an individual process or heterogeneity of the autoregressive term. Panel cointegration tests are done using Pedroni's parametric *(ADF and panel v)* and non-parametric *( pp and rho)* statistics. Table 3.14 presents panel cointegration tests for the log portfolio weight of equities. They are presented with the unit specific intercept and unit specific time trend and with only the individual intercept.

Table 3.14: Pedroni Panel Cointegration Tests

| Within-dimension | | | |
|---|---|---|---|
| | Test Statistics | Constant | Constant and Trend |
| | *Panel v* | 29.3789 *** | 34.1439 *** |
| | | (0.0000) | (0.0000) |
| | *Panel rho* | -21.2781*** | -26.3287*** |
| | | (0.0000) | (0.0000) |
| | *Panel pp* | -20.9231*** | -29.1336*** |
| | | (0.0000) | (0.0000) |
| | *Panel ADF* | -21.0471*** | -29.3509*** |
| | | (0.0000) | (0.0000) |
| Between-dimension | | | |
| | *Group rho* | -30.7937 *** | -30.0714 *** |
| | | (0.0000) | (0.0000) |
| | *Group pp* | -29.9767 *** | -34.1799 *** |
| | | (0.0000) | (0.0000) |
| | *Group ADF* | -30.0029 *** | -34.4677 *** |
| | | (0.0000) | (0.0000) |

Null hypothesis: No cointegration. Common (same) AR parameters for within dimension.
Alternative hypothesis: individual (panel-specific) AR parameters for between-dimension.
Specification: lshare, Fed, $CBOE_{VIX}$, $MSCI_{EM}$, $MSCI_{WD}$.
P-values in parentheses. Levels of significance. * $p < 0.1$, **$p < 0.05$, *** $p < 0.01$

Table 3.15 and table 3.16 present additional panel cointegration tests for the log portfolio weight of equities. The results suggest strong evidence of cointegration between portfolio weight, the shadow short rate, global risk sentiment and returns in advanced economies and emerging markets equities. All the test statistics are statistically significant. Considering these results, it is possible to estimate the long-run relationship using panel time series estimators.

Table 3.15: Westerlund ECM Panel Cointegration Tests

| Constant | Value | Z-value | p-value | Constant and trend | Value | Z-value | p-value |
|---|---|---|---|---|---|---|---|
| $G_t$ | -2.759 | -18.480 | 0.000 | $G_t$ | -3.601 | -26.353 | 0.000 |
| $G_a$ | -14.050 | -21.484 | 0.000 | $G_a$ | -21.560 | -24.693 | 0.000 |
| $P_t$ | -46.238 | -20.898 | 0.000 | $P_t$ | -58.752 | -26.597 | 0.000 |
| $P_a$ | -12.920 | -31.729 | 0.000 | $P_a$ | -19.963 | -31.332 | 0.000 |

The null hypothesis of the Westerlund test is no cointegration. Specification: lshare, Fed, $CBOE_{VIX}$, $MSCI_{EM}$, $MSCI_{WD}$.

Table 3.16: Kao Residual Cointegration Test

| | Statistic | p-value |
|---|---|---|
| Dickey-Fuller t | -24.9255 | 0.000 |
| Modified Dickey-Fuller t | -43.6568 | 0.000 |
| Augmented Dickey-Fuller t | -19.2580 | 0.000 |
| Unadjusted Dickey-Fuller t | -24.9908 | 0.000 |
| Unadjusted Modified Dickey-Fuller t | -44.0142 | 0.000 |

The null hypothesis of the Kao test is no cointegration. Specification: lshare, Fed, $CBOE_{VIX}$, $MSCI_{EM}$, $MSCI_{WD}$.

### 3.A.3 Long-run cointegration relationship estimation

Considering the cointegrating non-stationary variables as evidenced from unit root and cointegration tests, it is possible to estimate the long-run relationship. Several estimators have been proposed in the literature for the estimation of the long-run relationship. Considering that our macro panel time series consists of a large N and large T, it introduces additional issues for estimation. The long time series dimension brings about the challenge of obtaining spurious regression results. Furthermore, the estimation of the panel OLS estimator of a long-run static model will not provide consistent estimates (Baltagi2008). In the presence of a large number of observations across time, there is potential to use the heterogeneous regression rather than homogeneous or pooled regressions. To address the concerns of a large panel where non-stationarity and cointegration are a concern, several panel time series estimators have been proposed in the literature.

## 3.B Estimation Results

The tables below show the estimated effect of monetary policy by each advanced economy central bank (Federal Reserve, Bank of England, Bank of Japan and the European Central Bank) and other explanatory variables on the portfolio weight of country or region $Y_{it}$ in the portfolio of institutional investor firm $i$ in quarter $t$:

$$Y_{it} = \alpha + \beta M_t + \lambda X_t + \varepsilon_{it} \tag{3.2}$$

Variable $Y_{it}$ denotes the log portfolio weight of institutional investor firm $i$ in quarter $t$ of a country (e.g. U.S., U.K., Japan) or a group of countries (e.g. other advanced economies, emerging markets and developing economies). Variable $M_t$ captures different monetary policy stance measures (asset purchases, shadow policy rate, monetary policy surprises). The coefficient $\beta$ should identify the effects of monetary policy on the portfolio weights. The set of explanatory variables includes several factors. The total returns index for equities captured by the Morgan Stanley Capital International (MSCI). This is included as $MSCI_{EM}$ for emerging markets and $MSCI_{WD}$ for advanced economies. The $CBOE_{VIX}$ captures the Chicago Board Options Exchange (CBOE) volatility index. This measures the implied volatility of the Standards and Poor's (S&P 500) index to capture the impact of risk appetite. The returns on bonds are similarly captured separately for advanced and emerging market countries. The JP Morgan Emerging Markets Bond Index (EMBI)is used. The EMBI tracks the performance of hard currency bonds issued by emerging market economies. For advanced economies, the Bank of America Meryll Lynch bond index is used and defined as $BR_{AE}$. The inclusion of these return variables is account for the returns in alternative asset classes. Here, advanced economies' returns will be representative of a less risky alternate asset class than emerging market economies' assets considered to be more risky.

Table 3.17: Federal Reserve Bank Asset Purchases and allocation to equities (1999Q4-2016Q4)

| | Equity | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Fed | -0.000684 | 0.00324*** | 0.000269 | -0.00148 | 0.0140 | -0.00681** | -0.00398 |
| | (0.000968) | (0.000765) | (0.00230) | (0.00228) | (0.00825) | (0.00225) | (0.00241) |
| $CBOE_{VIX}$ | 0.00590*** | -0.00345* | -0.00328 | 0.00553 | -0.00740 | 0.0111** | 0.0241*** |
| | (0.00176) | (0.00139) | (0.00417) | (0.00414) | (0.0150) | (0.00409) | (0.00438) |
| $MSCI_{EM}$ | 0.000405*** | -0.000312*** | -0.000305 | 0.000792*** | 0.000237 | 0.000858*** | 0.00119*** |
| | (0.000102) | (0.0000803) | (0.000241) | (0.000240) | (0.000866) | (0.000236) | (0.000253) |
| $MSCI_{WD}$ | 0.000157 | -0.000145 | 0.000695** | 0.000233 | -0.00188* | 0.000375 | 0.000325 |
| | (0.0000982) | (0.0000775) | (0.000233) | (0.000231) | (0.000836) | (0.000228) | (0.000245) |
| N | 8,320.00 | 2,132.00 | 1,300.00 | 1,508.00 | 364.00 | 1,352.00 | 1,664.00 |
| $R^2$ | 0.02 | 0.08 | 0.04 | 0.05 | 0.17 | 0.08 | 0.13 |

Specification: $lshare = M_t + CBOE_{VIX} + MSCI_{EM} + MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is asset purchases denoted as Fed. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

## 3.B.1 Equities

### Central bank asset purchases and portfolio allocation to equities

Table 3.18: Bank of England Asset Purchases and allocation to equities (1999Q4-2016Q4)

| | Equity | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| BOE | 1.785*** | -0.849*** | 1.096 | 2.379*** | 3.640 | 3.555*** | 4.510*** |
| | (0.305) | (0.211) | (0.697) | (0.722) | (1.981) | (0.693) | (0.960) |
| $CBOE_{VIX}$ | 0.00833** | -0.00478** | 0.00310 | 0.0152* | 0.00763 | 0.0168** | 0.0224** |
| | (0.00254) | (0.00176) | (0.00581) | (0.00602) | (0.0165) | (0.00578) | (0.00800) |
| $MSCI_{EM}$ | 0.000510** | -0.000582*** | -0.000313 | 0.00102** | 0.00140 | 0.000318 | 0.00264*** |
| | (0.000159) | (0.000110) | (0.000364) | (0.000377) | (0.00103) | (0.000361) | (0.000501) |
| $MSCI_{WD}$ | 0.0000839 | 0.0000625 | 0.000356 | 0.000138 | -0.00136 | 0.000499 | -0.000149 |
| | (0.000136) | (0.0000938) | (0.000310) | (0.000321) | (0.000882) | (0.000309) | (0.000427) |
| N | 4840.00 | 1540.00 | 660.00 | 825.00 | 220.00 | 770.00 | 825.00 |
| $R^2$ | 0.04 | 0.20 | 0.01 | 0.12 | 0.10 | 0.08 | 0.32 |

Specification: $lshare = M_t + CBOE_{VIX} + MSCI_{EM} + MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is asset purchases denoted as BOE. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.19: European Central Bank Asset Purchases and allocation to equities (1999Q4-2016Q4)

| | Equity | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| ECB | 0.503 | -0.186 | -0.290 | 0.318 | 2.522 | 0.832 | 1.736 |
| | (0.286) | (0.206) | (0.678) | (0.803) | (1.743) | (0.626) | (0.900) |
| $CBOE_{VIX}$ | 0.00232 | -0.00113 | 0.00531 | 0.000515 | -0.00344 | 0.00477 | 0.00940 |
| | (0.00272) | (0.00196) | (0.00647) | (0.00766) | (0.0166) | (0.00597) | (0.00859) |
| $MSCI_{EM}$ | 0.000546*** | -0.000540*** | -0.000310 | 0.00138** | 0.00174 | 0.000842* | 0.00204*** |
| | (0.000158) | (0.000114) | (0.000376) | (0.000445) | (0.000967) | (0.000347) | (0.000499) |
| $MSCI_{WD}$ | 0.000106 | -0.00000590 | 0.000932** | 0.000177 | -0.00171* | 0.000103 | 0.000353 |
| | (0.000140) | (0.000101) | (0.000333) | (0.000394) | (0.000856) | (0.000308) | (0.000442) |
| N | 4095.00 | 1430.00 | 520.00 | 650.00 | 260.00 | 585.00 | 650.00 |
| $R^2$ | 0.03 | 0.16 | 0.06 | 0.11 | 0.10 | 0.11 | 0.24 |

Specification: $lshare = M_t + CBOE_{VIX} + MSCI_{EM} + MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is asset purchases denoted as ECB. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.20: Bank of Japan Asset Purchases and allocation to equities

| | Equity | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| BOJ | -0.0587 | -0.158** | 0.891*** | -0.0409 | -1.103* | 0.168 | -0.406 |
| | (0.0776) | (0.0558) | (0.182) | (0.219) | (0.474) | (0.169) | (0.244) |
| $CBOE_{VIX}$ | 0.00367 | -0.00108 | 0.000414 | 0.00406 | 0.00439 | 0.00401 | 0.0158 |
| | (0.00262) | (0.00188) | (0.00616) | (0.00738) | (0.0160) | (0.00570) | (0.00824) |
| $MSCI_{EM}$ | 0.000515** | -0.000554*** | -0.000167 | 0.00132** | 0.00153 | 0.000847* | 0.00190*** |
| | (0.000158) | (0.000114) | (0.000372) | (0.000446) | (0.000965) | (0.000344) | (0.000498) |
| $MSCI_{WD}$ | 0.000203 | 0.0000633 | 0.000375 | 0.000273 | -0.000846 | 0.000105 | 0.000809 |
| | (0.000138) | (0.0000989) | (0.000323) | (0.000388) | (0.000840) | (0.000300) | (0.000433) |
| N | 4,095.00 | 1,430.00 | 520.00 | 650.00 | 260.00 | 585.00 | 650.00 |
| $R^2$ | 0.03 | 0.16 | 0.07 | 0.11 | 0.11 | 0.11 | 0.24 |

Specification: $lshare = M_t + CBOE_{VIX} + MSCI_{EM} + MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is asset purchases denoted as BOJ. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

### Shadow policy rate and portfolio allocation to equities

Table 3.21: Federal reserve shadow policy rate and allocation to equities

| | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Fed | 0.0254** | -0.0766* | -0.0387 | 0.123 | -0.0287 | 0.0284 |
| | (0.00933) | (0.0304) | (0.0366) | (0.0790) | (0.0283) | (0.0408) |
| $CBOE_{VIX}$ | -0.00175 | 0.00749 | -0.000253 | 0.0118 | 0.0103 | 0.0218** |
| | (0.00187) | (0.00611) | (0.00736) | (0.0159) | (0.00568) | (0.00821) |
| $MSCI_{EM}$ | -0.000369** | -0.000881* | 0.00100* | 0.00267* | 0.000583 | 0.00242*** |
| | (0.000126) | (0.000409) | (0.000493) | (0.00106) | (0.000381) | (0.000550) |
| $MSCI_{WD}$ | -0.000138 | 0.00135** | 0.000451 | -0.00213 | 0.000431 | 0.000257 |
| | (0.000134) | (0.000438) | (0.000528) | (0.00114) | (0.000408) | (0.000589) |
| N | 1,430.00 | 520.00 | 650.00 | 260.00 | 585.00 | 650.00 |
| $R^2$ | 0.17 | 0.09 | 0.11 | 0.13 | 0.12 | 0.25 |

Specification: *lshare* = $M_t$ + $CBOE_{VIX}$+ $MSCI_{EM}$ + $MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is the shadow policy rate denoted as Fed. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.22: Bank of England shadow policy rate and allocation to equities

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | US | UK | EU | Japan | OAE | EM |
| BOE | 0.0259** | -0.0672* | -0.0560 | 0.0910 | -0.0278 | 0.00859 |
| | (0.00800) | (0.0262) | (0.0313) | (0.0680) | (0.0244) | (0.0353) |
| $CBOE_{VIX}$ | -0.00215 | 0.00698 | 0.00585 | 0.00498 | 0.00714 | 0.0172* |
| | (0.00194) | (0.00637) | (0.00760) | (0.0165) | (0.00593) | (0.00858) |
| $MSCI_{EM}$ | -0.000274* | -0.000921* | 0.000663 | 0.00231* | 0.000568 | 0.00194*** |
| | (0.000116) | (0.000380) | (0.000453) | (0.000984) | (0.000354) | (0.000511) |
| $MSCI_{WD}$ | -0.000132 | 0.00114** | 0.000589 | -0.00162 | 0.000282 | 0.000617 |
| | (0.000121) | (0.000396) | (0.000473) | (0.00103) | (0.000369) | (0.000534) |
| N | 1430.00 | 520.00 | 650.00 | 260.00 | 585.00 | 650.00 |
| $R^2$ | 0.17 | 0.08 | 0.12 | 0.12 | 0.11 | 0.23 |

Specification: *lshare* = $M_t$ + $CBOE_{VIX}$+ $MSCI_{EM}$ + $MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is the shadow policy rate denoted as BOE. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.23: European central bank shadow policy rate and allocation to equities

| | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| ECB | 0.0291** | -0.0832** | -0.0386 | 0.0313 | -0.0490 | -0.0523 |
| | (0.00974) | (0.0318) | (0.0384) | (0.0834) | (0.0293) | (0.0422) |
| $CBOE_{VIX}$ | -0.00112 | 0.00678 | 0.00439 | -0.00150 | 0.00555 | 0.00992 |
| | (0.00192) | (0.00628) | (0.00758) | (0.0165) | (0.00579) | (0.00834) |
| $MSCI_{EM}$ | -0.000516*** | -0.000389 | 0.00129** | 0.00175 | 0.000783* | 0.00198*** |
| | (0.000118) | (0.000385) | (0.000465) | (0.00101) | (0.000355) | (0.000511) |
| $MSCI_{WD}$ | 0.000151 | 0.000477 | 0.00000495 | -0.00139 | -0.000103 | 0.000142 |
| | (0.0000976) | (0.000318) | (0.000385) | (0.000836) | (0.000293) | (0.000423) |
| N | 1,430.00 | 520.00 | 650.00 | 260.00 | 585.00 | 650.00 |
| $R^2$ | 0.17 | 0.09 | 0.12 | 0.10 | 0.12 | 0.24 |

Specification: $lshare = M_t + CBOE_{VIX} + MSCI_{EM} + MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is the shadow policy rate denoted as ECB. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.24: Bank of Japan shadow policy rate and allocation to equities

| | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| BOJ | 0.0487*** | -0.146** | -0.0680 | 0.123 | -0.0760 | -0.0171 |
| | (0.0146) | (0.0471) | (0.0573) | (0.124) | (0.0441) | (0.0642) |
| $CBOE_{VIX}$ | -0.00322 | 0.0114 | 0.00430 | -0.00136 | 0.00958 | 0.0150 |
| | (0.00198) | (0.00640) | (0.00779) | (0.0169) | (0.00599) | (0.00872) |
| $MSCI_{EM}$ | -0.000596*** | -0.000175 | 0.00152*** | 0.00164 | 0.000910** | 0.00204*** |
| | (0.000114) | (0.000370) | (0.000450) | (0.000973) | (0.000346) | (0.000503) |
| $MSCI_{WD}$ | 0.000109 | 0.000543 | 0.0000500 | -0.00110 | 0.00000229 | 0.000500 |
| | (0.0000989) | (0.000320) | (0.000389) | (0.000843) | (0.000299) | (0.000436) |
| N | 1,430.00 | 520.00 | 650.00 | 260.00 | 585.00 | 650.00 |
| $R^2$ | 0.17 | 0.10 | 0.11 | 0.12 | 0.12 | 0.23 |

Specification: $lshare = M_t + CBOE_{VIX} + MSCI_{EM} + MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is the shadow policy rate denoted as BOJ. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.25: Federal reserve unconventional monetary surprise and allocation to equities

| | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Fed | -0.0286 | 1.018 | -0.835 | -1.333 | 1.189* | -1.097* |
| | (0.178) | (0.606) | (0.632) | (1.256) | (0.587) | (0.527) |
| $CBOE_{VIX}$ | 0.000925 | 0.0133 | 0.00746 | 0.000281 | 0.0305*** | -0.00720 |
| | (0.00216) | (0.00737) | (0.00768) | (0.0153) | (0.00713) | (0.00641) |
| $MSCI_{EM}$ | -0.0000860 | -0.000505 | 0.0000792 | 0.00144* | 0.00150*** | -0.000378 |
| | (0.0000928) | (0.000316) | (0.000330) | (0.000655) | (0.000306) | (0.000275) |
| $MSCI_{WD}$ | -0.0000388 | 0.00100*** | -0.0000445 | -0.00121* | 0.000372 | -0.000255 |
| | (0.0000858) | (0.000292) | (0.000305) | (0.000605) | (0.000283) | (0.000254) |
| N | 1,550.00 | 1100.00 | 1,225.00 | 325.00 | 1,200.00 | 1,325.00 |
| $R^2$ | 0.03 | 0.08 | 0.01 | 0.18 | 0.03 | 0.01 |

Specification: *lshare* = $M_t$ + $CBOE_{VIX}$+ $MSCI_{EM}$ + $MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is the monetary policy surprise or monetary policy shock denoted as Fed. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

**Unconventional monetary policy surprise**

Table 3.26: Bank of England unconventional monetary policy surprise and allocation to equities

| | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| BOE | 0 | 0 | 0 | 0 | 0 | 0 |
| | (0.212) | (0.604) | (0.617) | (1.192) | (0.534) | (0.534) |
| $CBOE_{VIX}$ | 0.000591 | 0.292*** | 0.129*** | 0.296*** | 0.251*** | 0.178*** |
| | (0.00288) | (0.00821) | (0.00839) | (0.0162) | (0.00727) | (0.00726) |
| $MSCI_{EM}$ | -0.000909*** | -0.0129*** | -0.00618*** | -0.0120*** | -0.00911*** | -0.00655*** |
| | (0.000168) | (0.000478) | (0.000489) | (0.000944) | (0.000423) | (0.000423) |
| $MSCI_{WD}$ | -0.000157 | 0.000458 | -0.000609* | -0.00207*** | -0.000572* | -0.000564* |
| | (0.0000987) | (0.000281) | (0.000287) | (0.000555) | (0.000249) | (0.000249) |
| N | 828.00 | 672.00 | 720.00 | 204.00 | 720.00 | 768.00 |
| $R^2$ | 0.01 | 0.09 | 0.01 | 0.13 | 0.02 | 0.02 |

Specification: $lshare = M_t + CBOE_{VIX} + MSCI_{EM} + MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is the monetary policy surprise or monetary policy shock denoted as BOE. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.27: European central bank unconventional monetary policy surprise and allocation to equities

| | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| ECB | 0.195 | 0.569 | -0.321 | 1.003 | -1.002 | 0.341 |
| | (0.222) | (0.759) | (0.790) | (1.568) | (0.733) | (0.660) |
| $CBOE_{VIX}$ | 0.0000435 | 0.00390 | 0.0126 | 0.00456 | 0.0232*** | -0.00212 |
| | (0.00192) | (0.00656) | (0.00683) | (0.0136) | (0.00633) | (0.00570) |
| $MSCI_{EM}$ | -0.0000574 | -0.000839* | 0.0000709 | 0.00163* | 0.00115*** | -0.000264 |
| | (0.0000964) | (0.000329) | (0.000343) | (0.000680) | (0.000318) | (0.000286) |
| $MSCI_{WD}$ | -0.0000552 | 0.000916** | 0.0000447 | -0.00113 | 0.000345 | -0.000170 |
| | (0.0000867) | (0.000296) | (0.000308) | (0.000612) | (0.000286) | (0.000258) |
| N | 1,550.00 | 1,100.00 | 1,225.00 | 325.00 | 1,200.00 | 1325.00 |
| $R^2$ | 0.02 | 0.08 | 0.01 | 0.18 | 0.03 | 0.01 |

Specification: $lshare = M_t + CBOE_{VIX} + MSCI_{EM} + MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is the monetary policy surprise or monetary policy shock denoted as ECB. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.28: Bank of Japan unconventional monetary policy surprise and allocation to equities

| | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| BOJ | 2.892*** | -4.229 | 3.250 | 4.711 | -1.802 | 5.995* |
| | (0.808) | (2.755) | (2.872) | (5.705) | (2.667) | (2.396) |
| $CBOE_{VIX}$ | 0.00384* | 0.000320 | 0.0151* | 0.0124 | 0.0159* | 0.00330 |
| | (0.00193) | (0.00660) | (0.00688) | (0.0137) | (0.00639) | (0.00574) |
| $MSCI_{EM}$ | 0.000144 | -0.00101** | 0.000313 | 0.00209** | 0.000950** | 0.0000670 |
| | (0.0000940) | (0.000320) | (0.000334) | (0.000663) | (0.000310) | (0.000279) |
| $MSCI_{WD}$ | 0.0000439 | 0.000777** | 0.0000888 | -0.000926 | 0.0000851 | -0.0000522 |
| | (0.0000852) | (0.000291) | (0.000303) | (0.000602) | (0.000281) | (0.000253) |
| N | 1,550.00 | 1,100.00 | 1,225.00 | 325.00 | 1,200.00 | 1325.00 |
| $R^2$ | 0.03 | 0.08 | 0.01 | 0.18 | 0.03 | 0.01 |

Specification: *lshare* = $M_t$ + $CBOE_{VIX}$+ $MSCI_{EM}$ + $MSCI_{WD}$. The dependent variable is log portfolio weight to equity $Y_{it}$ or *(lshare)*. $M_t$ is the monetary policy surprise or monetary policy shock denoted as BOJ. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.29: Federal reserve bank asset purchases and allocation to bonds

| | Bonds | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Fed | 0.00301 | 0.00827 | 0.00114 | -0.00225 | -0.0822 | -0.0179*** | -0.0168 |
| | (0.00596) | (0.00634) | (0.000650) | (0.00510) | (0.112) | (0.00390) | (0.0108) |
| $CBOE_{VIX}$ | -0.00676 | -0.0184 | 0.00371** | 0.00484 | 0.0306 | 0.0259** | -0.0171 |
| | (0.0102) | (0.0108) | (0.00127) | (0.00871) | (0.234) | (0.00886) | (0.0219) |
| $JPM_{EMBI}$ | -0.0115*** | -0.0191*** | 0.000372 | -0.00379* | -0.0743** | 0.00812*** | -0.0152** |
| | (0.00222) | (0.00236) | (0.000225) | (0.00190) | (0.0282) | (0.00180) | (0.00535) |
| $BR_{AE}$ | 0.0171** | 0.0392*** | -0.00157* | -0.00498 | 0.123 | -0.0205*** | 0.0420** |
| | (0.00576) | (0.00613) | (0.000652) | (0.00493) | (0.0870) | (0.00468) | (0.0140) |
| N | 104.00 | 52.00 | 38.00 | 52.00 | 16.00 | 27.00 | 36.00 |
| $R^2$ | 0.75 | 0.89 | 0.27 | 0.75 | 1.00 | 0.92 | 0.55 |

Specification: *lshare* = $M_t$ + $CBOE_{VIX}$+ $JPM_{EMBI}$ + $BR_{AE}$. The dependent variable is log portfolio weight to bonds $Y_{it}$ or *(lshare)*. $M_t$ is asset purchases denoted as Fed. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

## 3.B.2 Bonds

### Central bank asset purchases and portfolio allocation to bonds

Table 3.30: Bank of England asset purchases and allocation to bonds

| | Bonds | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| BOE | 0.00160 | 0.420 | 1.245*** | -0.416 | 0 | -4.676 | -3.290 |
| | (0.926) | (1.238) | (0.151) | (1.060) | (26.34) | (5.504) | (2.905) |
| $CBOE_{VIX}$ | -0.00451 | 0.00202 | -0.00503** | -0.0110 | 0 | 0.218*** | 0.0850** |
| | (0.00803) | (0.0107) | (0.00195) | (0.00920) | (0.284) | (0.0411) | (0.0263) |
| $JPM_{EMBI}$ | -0.00738*** | -0.0118*** | -0.00109** | -0.00297 | -0.0443** | 0.0412*** | 0.000121 |
| | (0.00193) | (0.00259) | (0.000367) | (0.00221) | (0.0156) | (0.00841) | (0.00680) |
| $BR_{AE}$ | 0.00827 | 0.0196** | 0.00286** | -0.00304 | 0.0751 | -0.0864*** | -0.00319 |
| | (0.00478) | (0.00639) | (0.00107) | (0.00547) | (0.0750) | (0.0251) | (0.0169) |
| N | 110.00 | 55.00 | 30.00 | 55.00 | 8.00 | 48.00 | 48.00 |
| $R^2$ | 0.67 | 0.76 | 0.53 | 0.68 | 1.00 | 0.45 | 0.31 |

Specification: $lshare = M_t + CBOE_{VIX} + JPM_{EMBI} + BR_{AE}$. The dependent variable is log portfolio weight to bonds $Y_{it}$ or *(lshare)*. $M_t$ is asset purchases denoted as BOE. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.31: European Central Bank asset purchases and allocation to bonds

| | Bonds | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| ECB | 0.00287 | -1.430 | 0.280** | 1.436 | 0 | 2.522*** | 7.512** |
| | (0.891) | (1.031) | (0.0910) | (0.829) | (10.70) | (0.514) | (2.441) |
| $CBOE_{VIX}$ | -0.0127 | -0.00834 | -0.000673 | -0.0170* | 1.229*** | -0.0174* | 0.0852*** |
| | (0.00833) | (0.00964) | (0.00125) | (0.00775) | (0.157) | (0.00711) | (0.0253) |
| $JPM_{EMBI}$ | -0.0116*** | -0.0167*** | -0.000146 | -0.00646*** | -0.155*** | 0.00557*** | 0.00344 |
| | (0.00187) | (0.00217) | (0.000220) | (0.00174) | (0.0190) | (0.00141) | (0.00642) |
| $BR_{AE}$ | 0.0184*** | 0.0316*** | 0.000393 | 0.00532 | 0.430*** | -0.0203*** | -0.0130 |
| | (0.00461) | (0.00534) | (0.000625) | (0.00429) | (0.0435) | (0.00367) | (0.0160) |
| N | 128.00 | 64.00 | 38.00 | 64.00 | 16.00 | 27.00 | 48.00 |
| $R^2$ | 0.76 | 0.88 | 0.43 | 0.77 | 1.00 | 0.95 | 0.33 |

Specification: $lshare = M_t + CBOE_{VIX} + JPM_{EMBI} + BR_{AE}$. The dependent variable is log portfolio weight to bonds $Y_{it}$ or *(lshare)*. $M_t$ is asset purchases denoted as ECB. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.32: Bank of Japan asset purchases and allocations to bonds

| | (1) Bonds | (2) US | (3) UK | (4) EU | (5) Japan | (6) OAE | (7) EM |
|---|---|---|---|---|---|---|---|
| BOJ | -1.364*** | -0.966*** | 0.359*** | -1.763*** | 25.41*** | 1.905*** | 1.902** |
| | (0.227) | (0.268) | (0.0407) | (0.196) | (4.737) | (0.412) | (0.673) |
| $CBOE_{VIX}$ | -0.00511 | -0.00485 | -0.00110 | -0.00537 | 0.535* | 0.159*** | 0.0672* |
| | (0.00817) | (0.00964) | (0.00133) | (0.00707) | (0.246) | (0.00893) | (0.0270) |
| $JPM_{EMBI}$ | -0.00810*** | -0.0147*** | -0.000954*** | -0.00152 | -0.113*** | 0.00722*** | -0.00742 |
| | (0.00189) | (0.00224) | (0.000243) | (0.00164) | (0.0307) | (0.00193) | (0.00700) |
| $BR_{AE}$ | 0.0112* | 0.0272*** | 0.00148* | -0.00484 | 0.127 | 0.0431*** | 0.0125 |
| | (0.00459) | (0.00541) | (0.000699) | (0.00397) | (0.0687) | (0.00507) | (0.0172) |
| N | 128.00 | 64.00 | 38.00 | 64.00 | 16.00 | 27.00 | 48.00 |
| r2 | 0.78 | 0.87 | 0.40 | 0.81 | 1.00 | 0.89 | 0.30 |

Specification: $lshare = M_t + CBOE_{VIX} + JPM_{EMBI} + BR_{AE}$. The dependent variable is log portfolio weight to bonds $Y_{it}$ or *(lshare)*. $M_t$ is asset purchases denoted as BOJ. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.33: Bank of England shadow policy rate and allocation to bonds

| | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| BOE | -0.0490 | -0.00361 | 0.0354 | 2.727*** | 0.0917*** | 0.163* |
| | (0.0352) | (0.00417) | (0.0289) | (0.216) | (0.0124) | (0.0816) |
| $CBOE_{VIX}$ | -0.0241* | 0.00633*** | -0.00508 | 0.0300 | 0.0548*** | 0.131*** |
| | (0.00946) | (0.00118) | (0.00777) | (0.142) | (0.00371) | (0.0259) |
| $JPM_{EMBI}$ | -0.0176*** | 0.000785*** | -0.00594*** | 0.0564** | 0.00723*** | 0.00356 |
| | (0.00212) | (0.000212) | (0.00174) | (0.0179) | (0.000740) | (0.00653) |
| $BR_{AE}$ | 0.0312*** | -0.00329*** | 0.00588 | -0.190*** | 0.0106*** | -0.00495 |
| | (0.00530) | (0.000773) | (0.00436) | (0.0392) | (0.00205) | (0.0165) |
| N | 64.00 | 38.00 | 64.00 | 16.00 | 27.00 | 48.00 |
| $R^2$ | 0.90 | 0.32 | 0.77 | 1.00 | 0.96 | 0.34 |

Specification: *lshare* = $M_t$ + $CBOE_{VIX}$+ $JPM_{EMBI}$ + $BR_{AE}$. The dependent variable is log portfolio weight to bonds $Y_{it}$ or *(lshare)*. $M_t$ is the shadow policy rate denoted as BOE. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

**Shadow policy rate and portfolio allocation to bonds**

Table 3.34: European central bank shadow policy rate and allocation to bonds

| | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| ECB | 0.00461 | 0.000857 | 0.00782 | -1.089* | 0.0862** | 0.125 |
| | (0.0312) | (0.00484) | (0.0306) | (0.510) | (0.0311) | (0.0839) |
| $CBOE_{VIX}$ | -0.0443*** | 0.00454*** | -0.0147 | 0.600** | 0.00405 | 0.106*** |
| | (0.00815) | (0.00122) | (0.00800) | (0.193) | (0.00686) | (0.0272) |
| $JPM_{EMBI}$ | -0.0181*** | 0.000600* | -0.00647*** | -0.0910*** | 0.00528*** | 0.0000455 |
| | (0.00178) | (0.000236) | (0.00175) | (0.0272) | (0.00135) | (0.00647) |
| $BR_{AE}$ | 0.0363*** | -0.00253** | 0.00618 | 0.122 | -0.0128** | 0.00114 |
| | (0.00463) | (0.000827) | (0.00455) | (0.0752) | (0.00423) | (0.0162) |
| N | 64.00 | 38.00 | 64.00 | 16.00 | 27.00 | 48.00 |
| $R^2$ | 0.92 | 0.35 | 0.78 | 1.00 | 0.94 | 0.35 |

Specification: *lshare* $= M_t + CBOE_{VIX} + JPM_{EMBI} + BR_{AE}$. The dependent variable is log portfolio weight to bonds $Y_{it}$ or *(lshare)*. $M_t$ is the shadow policy rate denoted as ECB. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.35: Bank of Japan shadow policy rate and portfolio allocation to bonds

| | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| BOJ | 0.254*** | -0.0172 | 0.207*** | 2.114** | -0.325** | 0.0175 |
| | (0.0668) | (0.0101) | (0.0395) | (0.650) | (0.124) | (0.180) |
| $CBOE_{VIX}$ | -0.0110 | 0.00361** | 0.00562 | -0.0181 | 0.0360*** | 0.118*** |
| | (0.00867) | (0.00132) | (0.00513) | (0.166) | (0.00891) | (0.0263) |
| $JPM_{EMBI}$ | -0.0129*** | -0.0000599 | -0.000462 | -0.00641 | 0.00503* | 0.00464 |
| | (0.00202) | (0.000234) | (0.00120) | (0.0216) | (0.00229) | (0.00703) |
| $BR_{AE}$ | 0.0231*** | -0.000503 | -0.00795** | 0.000536 | -0.0128** | -0.0149 |
| | (0.00483) | (0.000691) | (0.00286) | (0.0448) | (0.00472) | (0.0168) |
| N | 64.00 | 38.00 | 64.00 | 16.00 | 27.00 | 48.00 |
| $R^2$ | 0.90 | 0.31 | 0.85 | 1.00 | 0.89 | 0.41 |

Specification: *lshare* $= M_t + CBOE_{VIX} + JPM_{EMBI} + BR_{AE}$. The dependent variable is log portfolio weight to bonds $Y_{it}$ or *(lshare)*. $M_t$ is the shadow policy rate denoted as BOJ. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.36: Federal reserve monetary policy surprise and allocation to bonds

| | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Fed | 5.895*** | 0 | 0.231 | 0 | -12.60*** | -4.666 |
| | (1.510) | (0.254) | (0.976) | (11.34) | (1.227) | (2.687) |
| $CBOE_{VIX}$ | -0.0132 | 0.0311*** | 0.0439*** | -0.114 | -0.0635*** | -0.0250 |
| | (0.0150) | (0.00328) | (0.00970) | (0.207) | (0.0148) | (0.0288) |
| $JPM_{EMBI}$ | -0.0170*** | -0.00268*** | -0.00730*** | -0.0708* | 0.00944*** | -0.00592 |
| | (0.00275) | (0.000525) | (0.00178) | (0.0294) | (0.00264) | (0.00596) |
| $BR_{AE}$ | 0.0335*** | 0.0148*** | 0.0159** | 0.120 | -0.0326*** | 0.0111 |
| | (0.00956) | (0.00188) | (0.00618) | (0.117) | (0.00922) | (0.0198) |
| N | 100.00 | 16.00 | 25.00 | 8.00 | 18.00 | 60.00 |
| R | 0.70 | 1.00 | 0.94 | 1.00 | 1.00 | 0.20 |

Specification: *lshare* = $M_t$ + $CBOE_{VIX}$+ $JPM_{EMBI}$ + $BR_{AE}$. The dependent variable is log portfolio weight to bonds $Y_{it}$ or *(lshare)*. $M_t$ is the monetary policy surprise or monetary policy shock denoted as Fed. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

### Unconventional monetary policy surprise

Table 3.37: Bank of England monetary policy surprise and allocation to bonds

| | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| BOE | 0 | 0 | 0 | 0 | 0 | 0 |
| | (1.724) | (0.000421) | (0.705) | (12.34) | (1.900) | (3.135) |
| $CBOE_{VIX}$ | -0.0763*** | 0 | 0.0354*** | 0 | 0 | 0.0544 |
| | (0.0205) | (0.00000547) | (0.00837) | (0.150) | (0.00946) | (0.0425) |
| $JPM_{EMBI}$ | -0.0203*** | -0.000000294 | -0.00316* | -0.0191 | 0.0254*** | 0.0124 |
| | (0.00376) | (0.000000757) | (0.00154) | (0.0220) | (0.00190) | (0.00955) |
| $BR_{AE}$ | 0.0341** | 0 | -0.00333 | 0 | -0.0680*** | -0.0434 |
| | (0.0132) | (0.00000281) | (0.00538) | (0.0640) | (0.00704) | (0.0314) |
| N | 48.00 | 7.00 | 12.00 | 4.00 | 8.00 | 45.00 |
| $R^2$ | 0.68 | 1.00 | 1.00 | 1.00 | 1.00 | 0.19 |

Specification: *lshare* = $M_t$ + $CBOE_{VIX}$+ $JPM_{EMBI}$ + $BR_{AE}$. The dependent variable is log portfolio weight to bonds $Y_{it}$ or *(lshare)*. $M_t$ is the monetary policy surprise or monetary policy shock denoted as BOE. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.38: European central bank monetary policy surprise and allocation to bonds

| | US | UK | EU | Japan | OAE | EM |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| ECB | -13.27*** | 3.151*** | -1.121 | 0 | 58.70*** | -6.257 |
| | (1.804) | (0.328) | (1.340) | (6.653) | (1.406) | (5.121) |
| $CBOE_{VIX}$ | -0.00926 | -0.00900** | 0.0454*** | -0.114 | 0.229*** | 0.0175 |
| | (0.0131) | (0.00304) | (0.00971) | (0.168) | (0.0127) | (0.0258) |
| $JPM_{EMBI}$ | -0.0169*** | -0.00161** | -0.00752*** | -0.0708** | 0.0193*** | -0.00487 |
| | (0.00272) | (0.000512) | (0.00202) | (0.0259) | (0.00255) | (0.00590) |
| $BR_{AE}$ | 0.0201* | 0.0147*** | 0.0142* | 0.120 | 0.294*** | 0.00388 |
| | (0.00948) | (0.00179) | (0.00704) | (0.0991) | (0.00882) | (0.0195) |
| N | 100.00 | 16.00 | 25.00 | 8.00 | 18.00 | 60.00 |
| $R^2$ | 0.72 | 1.00 | 0.94 | 1.00 | 0.98 | 0.19 |

Specification: *lshare* = $M_t$ + $CBOE_{VIX}$+ $JPM_{EMBI}$ + $BR_{AE}$. The dependent variable is log portfolio weight to bonds $Y_{it}$ or *(lshare)*. $M_t$ is the monetary policy surprise or monetary policy shock denoted as ECB. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.39: Bank of Japan monetary policy surprise and allocation to bonds

| | (1) US | (2) UK | (3) EU | (4) Japan | (5) OAE | (6) EM |
|---|---|---|---|---|---|---|
| BOJ | -29.18*** | 0 | -1.586 | 0 | 102.3*** | -12.52 |
| | (6.792) | (1.300) | (4.637) | (31.37) | (5.975) | (15.15) |
| $CBOE_{VIX}$ | -0.0387** | -0.0152*** | 0.0393*** | -0.114 | -0.181*** | -0.00366 |
| | (0.0133) | (0.00335) | (0.00905) | (0.154) | (0.0129) | (0.0263) |
| $JPM_{EMBI}$ | -0.0205*** | 0.000581 | -0.00735*** | -0.0708** | 0.0408*** | -0.00711 |
| | (0.00277) | (0.000566) | (0.00189) | (0.0239) | (0.00263) | (0.00595) |
| $BR_{AE}$ | 0.0458*** | 0.00953*** | 0.0147* | 0.120 | -0.134*** | 0.0165 |
| | (0.00954) | (0.00202) | (0.00651) | (0.0780) | (0.00909) | (0.0197) |
| N | 100.00 | 16.00 | 25.00 | 8.00 | 18.00 | 60.00 |
| $R^2$ | 0.72 | 1.00 | 0.94 | 1.00 | 0.99 | 0.21 |

Specification: *lshare* = $M_t$ + $CBOE_{VIX}$+ $JPM_{EMBI}$ + $BR_{AE}$. The dependent variable is log portfolio weight to bonds $Y_{it}$ or *(lshare)*. $M_t$ is the monetary policy surprise or monetary policy shock denoted as BOJ. Standard errors in parentheses. Levels of significance: * p <0.1, ** p<0.05, *** p <0.01

Table 3.40: List of Countries

| Firm Domicile Countries | Destination Countries | | |
|---|---|---|---|
| Australia | Algeria | Hong Kong | Peru |
| Belgium | Argentina | Hungary | Philippines |
| Canada | Australia | Iceland | Poland |
| Denmark | Austria | India | Portugal |
| France | Bahrain | Indonesia | Qatar |
| Germany | Bangladesh | Iraq | Romania |
| Italy | Belgium | Ireland | Russia |
| Japan | Belize | Israel | Singapore |
| Netherlands | Bermuda | Italy | Slovakia |
| South Africa | Brazil | Ivory Coast | Slovenia |
| Switzerland | Bulgaria | Jamaica | South Africa |
| United Kingdom | Canada | Japan | South Korea |
| United States | Chile | Jordan | Spain |
| | China | Kazakhstan | Sri Lanka |
| | Colombia | Kenya | Switzerland |
| | Costa Rica | Kuwait | Taiwan |
| | Croatia | Lebanon | Tanzania |
| | Cyprus | Luxembourg | Thailand |
| | Czech Rep | Macao | Togo |
| | Denmark | Malaysia | Trinidad and Tobago |
| | Dominican Republic | Malta | Turkey |
| | Ecuador | Mauritius | United Arab Emirates |
| | Egypt | Mexico | United States |
| | El Salvador | Morocco | Uruguay |
| | Estonia | Netherlands | Venezuela |
| | Euro Area | New Zealand | Vietnam |
| | Finland | Nigeria | Zambia |
| | France | Norway | |
| | Gabon | Oman | |
| | Georgia | Pakistan | |
| | Germany | Panama | |
| | Ghana | Papua New Guinea | |
| | Greece | Paraguay | |

# Chapter 4

# Uncertainty and Foreign Direct Investment

## 4.1 Introduction

Emerging market and developing economies (EMDEs) have experienced a significant increase in capital flows, enhancing financial integration with the rest of the world. While this has facilitated easier access to global financial markets, it has also resulted in challenges emanating from shifts in external financial conditions especially for countries where the volume of capital flows in proportion to economic size is considerably large. For these economies, fluctuations in capital flows generate significant effects. While part of the expansion and contraction in flows is due to shocks in macroeconomic variables, however much of the sources of this variation are still unaccountable (Gourio et al., 2016). Fluctuations in flows compelled by macroeconomic factors or fundamentals such as productivity could be an indication of the redistribution of capital across countries in search for higher yields. Conversely, fluctuations caused by non-economic factors such as investor sentiment or herding behaviour may compel policy intervention to inhibit the macroeconomic and financial instabilities that may arise from the volatility of capital flows (Choi and Furceri, 2019; Ahmed and Zlate, 2014).

Uncertainty shocks exert a significant negative effect on macroeconomic activity (Bloom, 2009). Assessed using various proxies in the literature, an increase in economic uncertainty adversely affects consumption, investment, production and employment (Bloom, 2009; Baker et al., 2016). While evidence of this unfavourable effect of economic uncertainty has been shown for macroeconomic activity and equity markets, the effects of uncertainty on cross-border capital flows remains limited. Empirical

studies analysing the sensitivity of different types of cross-border capital flows to uncertainty shocks reveal negative significant effects. This evidenced from examining the effects of uncertainty on aggregate capital flows (Gourio et al., 2016). Other studies have used the sub-components of capital flows in explaining the sensitivity of flows to uncertainty. The negative influence of uncertainty has been found for foreign direct investment flows (Julio and Yook, 2016), portfolio flows (Gauvin et al., 2014) and bank flows (Wang, 2018; Choi and Furceri, 2019).

I extend the literature by examining the effects of economic uncertainty on foreign direct investment to emerging market and developing economies. While the negative influence of uncertainty on capital flows has been found in various empirical studies, limited evidence exists on the degree to which this effect differs across various kinds of uncertainty. Choi and Shim (2019) highlight that the empirical literature has focused more on general rather than specific types of uncertainty. Moreover, they emphasise that although the impact of various types of uncertainty on the economy will vary depending its source, the focus of empirical studies has been on the homogeneous rather than heterogeneous impact of uncertainty owing to the high correlation between proxies of uncertainty. In this chapter, the impact of different kinds of uncertainty on foreign direct investment is analysed. Using various proxies, I estimate the impact of macroeconomic, financial, political and policy uncertainty on bilateral foreign direct investment flows using a gravity model.

There has been a substantial increase in direct cross-border investment in the global economy. Numerous studies examine the push and pull factors driving foreign direct investment flows. Through providing foreign investors with ownership and management control over assets, foreign direct investment provides a more stable and long-term investment (Cai et al., 2018). Moreover, in destination countries, foreign direct investment promotes the transfer of technology among countries and the opportunity to sell products on the international market.

Given that direct cross-border investment activity was adversely affected during the global financial crisis (GFC) along with heightened uncertainty globally, it is relevant to assess the role of uncertainty in explaining the pattern of capital flows. Nevertheless, the literature has progressively concentrated on the effects of uncertainty on macroeconomic activity (Baker et al., 2016). On the other hand, fewer studies examine the effects of uncertainty on international capital flows on a global level. It has been shown that global uncertainty or global risk aversion measured by the VIX is a significant supply side driver of cross-border capital flows (Forbes and Warnock, 2012; Rey, 2015). Limited studies use country-specific uncertainty to investigate the role of uncertainty in cross-border capital flows (Gourio et al., 2016; Gauvin et al., 2014; Julio and Yook,

2016). However, these studies are conducted at the aggregate level using Balance of Payments (BOP) statistics data.

This chapter contributes to the literature by examining the effects of higher uncertainty on foreign direct investment flows. Divergent from prior studies undertaken on an aggregate level, this chapter exploits bilateral flow data, an identification strategy adopted in Wang (2018) and Choi and Furceri (2019) in their analysis of the effects of heightened uncertainty on cross-border bank flows. Using a similar identification strategy, this chapter contributes to the limited studies that use cross-country heterogeneity in uncertainty to explain the movement in capital flows. Specifically, this chapter examines how multinational corporations adjust their foreign direct investment in response to higher uncertainty in both the origin and destination economies. This is done by using data on bilateral cross-border foreign direct investment from the OECD database to identify the role of country-specific uncertainty in determining foreign direct investment flows. Only Kellard et al. (2018) use country-specific uncertainty analyse the pattern of foreign direct investment flows. Moreover, while their analysis uses similar bilateral level foreign direct investment data, it is limited to uncertainty measures related sovereign risk and financial system (banking) risk and their empirical strategy estimates the impact on inward and outward foreign direct investment separately. This analysis does not distinguish between the effects from the source and destination country. Contrastingly, the analysis considers the effects of different types of uncertainty on foreign direct investment flows by estimating a gravity equation using the Poisson Pseudo maximum likelihood estimator with fixed effects with the inclusion of both origin and host countries. The dyadic structure of bilateral-level data permits for the control for fixed effects and improved identification of uncertainty effects (Choi and Furceri, 2019).[1]

I contribute to the literature by examining whether the effects of uncertainty regarding financial markets, economic policy and about the political and macroeconomic environment have different impact on foreign direct investment. The focus of this chapter is on emerging markets and developing economies (EMDEs) and the role of country-specific uncertainty in driving foreign direct investment flows. This chapter contributes to the literature analysing the effects of high uncertainty on cross-border capital flows in a bilateral setting. Therefore, I extend the literature by using bilateral level foreign direct investment flows to emerging market and developing countries and

[1]This strategy is similar to Julio and Yook (2016) in their investigation of the role of higher uncertainty arising from presidential elections in the host country on foreign direct investment inflows into the host country. However, this analysis is restricted to foreign direct investment flows coming solely from the United States. This implies that they only control for the supply-side of foreign direct investment and examine how cross-country heterogeneity in uncertainty explains foreign direct investment inflows into host countries.

country-specific measures of uncertainty. Using bilateral data, this chapter examines how variation in uncertainty across countries impacts foreign direct investment flows to emerging market and developing countries. This is a similar to Wang (2018) and Choi and Furceri (2019) who examine the role of uncertainty for bilateral bank flows and Kellard et al. (2018) on the role of risk on bilateral foreign direct investment. The main difference from these empirical studies is the consideration of the impact of different kinds of uncertainty in driving bilateral capital flows.

Four specific measures of uncertainty are used in this chapter are (i) stock market volatility to measure financial uncertainty (ii) economic policy uncertainty index from Baker et al. (2016) to measure economic policy uncertainty (iii) exchange rate volatility and price volatility to capture macroeconomic uncertainty and (iv) political risk indicators to capture political uncertainty. These measures are used to capture the different dimensions of uncertainty in the economy.

This chapter relates to work on foreign direct investment and the role of economic and political factors in both source and host countries as drivers of foreign direct investment. The literature has focused more on the economic factors (e.g. GDP, market size, level of development, etc.) and non-economic factors (e.g. institutional and political risk, investment environment etc.) of the host country as determinants of foreign direct investment. However, there is limited coverage of on the role of both economic and non-economic determinants of source countries (Feng, 2017). Although, the extant literature on the determinants of foreign direct investment focus on the host country economic and non-economic determinants there is also relevance in contrasting the role of home versus host country factors. Feng (2017) suggests that the assumption in the literature that home country conditions are constant or the same across countries is incorrect. [2]

Uncertainty may detrimental for the multinational corporation's investment activities and this effect may vary depending on whether it arises in the home country or host country. On the one hand, uncertainty at home may affect the capacity of the multinational corporation to venture abroad. Similarly, uncertainty in the host country may affect the profitability. It has been argued that the economic and political situation in the source country may also be relevant. For example, policy change following

[2]For example, political change in a source country may influence the volume of outward foreign direct investment if the political outcomes result in a policy shift toward investment in the domestic economy through more penalties or taxes on multinational corporations engaged in foreign direct investment activities abroad. Similarly, political or policy changes in the host country may encourage or deter capital flows. If the former this may be the case if the country is leaning toward making enhancing its attractiveness as a destination for foreign direct investment. Contrastingly, policy or political changes that favour more control and restrictions on the withdrawal of capital by non-residents from the domestic economy may induce outflows or alternatively result in the host country receiving less outflows.

an election may result in new incentives or conversely barriers for outward investment resulting in reduced outflows. Similarly, economic interests in the host country may be more receptive and encouraging toward foreign investment. Therefore, changes in the business environment in both source and host countries may be relevant for the foreign direct investment decision. The literature has focused more on the economic and non-economic(e.g. political risk) factors of host countries as determinants of foreign direct investment with limited literature focusing on the role of economic and non-economic determinants of This chapter examines the role of both as determinants of foreign direct investment flows.

The findings from the analysis of how multinational corporations adjust their cross-border direct investment in response to elevated uncertainty in the both the origin and recipient country are varied. The results using four measures of uncertainty regarding various aspects of the economy show that the different forms of uncertainty do not move in the same direction. Higher uncertainty regarding financial markets in the host country lowers foreign direct investment coming into the economy. This response is present for advanced economies and not emerging market recipient countries. Furthermore, political uncertainty is a significant determinant for foreign direct investment flows when the role of government stability is considered for host countries. For developed market recipients, heightened government instability induces multinational corporations to curtail foreign direct investment flows into the economy whereas for emerging market economies this matters less. For macroeconomic uncertainty, source country conditions are more relevant in driving bilateral foreign direct investment flows. Multinational corporations increase outward foreign direct investment in response to higher macroeconomic uncertainty at home. This effect is evident for foreign direct investment flows towards advanced economy and not emerging market recipients. Furthermore, multinational corporations' lower outflows in response to heightened economic policy uncertainty both at home and abroad. An increase in economic policy uncertainty in the source country discourages multinational corporations from engaging in risky foreign direct investment abroad resulting in lower outflows overall. Furthermore, advanced economies with higher policy uncertainty attract less foreign direct investment. In addition, greater economic policy uncertainty in the source country of the multinational firm, makes it less attractive for cross-border direct investment going to emerging market recipients. Economic policy uncertainty matters more for foreign direct investment to emerging market recipients. Therefore, advanced economies with greater uncertainty regarding financial, political, macroeconomic and economic policy attract less foreign direct investment flows. On the other hand, multinational corporations invest less in emerging market host countries with high economic policy uncertainty. The other aspects of uncertainty matter less for emerging market recipient countries.

The rest of the chapter proceeds as follows. Section 4.2 reviews recent empirical literature on uncertainty and its effects on different aspects of macroeconomic activities and capital flows. Section 4.3 describes the data on cross-border direct investment flows, uncertainty and other macroeconomic control variables. Section 4.4 provides the empirical framework and proposes the empirical strategy used. Section 4.5 presents the main results and robustness checks. Section 4.6 concludes.

## 4.2 Literature review

### 4.2.1 Risk and Uncertainty

The difference between risk and uncertainty initially identified by Frank Knight in 1921 (Guerron-Quintana, 2012; Bloom, 2014). He distinguished risk as the unknown outcomes whose probability of occurring can be approximated or at least informed about. Knight characterised risk as a set of events for which the probability distribution is known. Within the literature this has been described as *Knightian risk* or *subjective uncertainty* (Guerron-Quintana, 2012). In contrast, Knight identified uncertainty as the unknown outcomes or unanticipated events for which the probability of occurrence cannot be measured or for which there is no information on the possible outcomes. Knight alternatively identified uncertainty as the incapacity of people to predict the probability of events occurring (Bloom, 2014). This inability to ascertain the likelihood of events occurring is alternatively referred to as *Knightian uncertainty* or *subjective uncertainty* (Guerron-Quintana, 2012). Due to the lack of information, probabilities of the potential outcomes cannot be assigned or there is no knowledge of all the potential outcomes that could occur. Uncertainty refers to the notion of the ambiguity pertaining to future macroeconomic outcomes as perceived by managers, consumers and policymakers but also to the indeterminacy of macroeconomic and microeconomic developments and occurrence of exogenous events (Bloom, 2014).

### 4.2.2 Transmission channels of uncertainty effects

There are several probable channels through which uncertainty may dampen output. Within the components of aggregate demand, investment is the most responsive to uncertainty, followed by much lesser sensitivity in consumption and no effect on government expenditure, (Bloom, 2017). Bloom's observation implies that the dampening effect of uncertainty shocks on gross domestic product (GDP) manifests through the

investment channel and to a lesser extent through consumption. This suggests that fluctuations in uncertainty impact on behaviour. According to Haddow et al. (2013), the role of uncertainty in affecting economic activity is identifiable through demand side and supply side channels detailed in table 4.1.

**Investment** This component of aggregate demand may be more responsive to uncertainty shocks due to the irreversibility of investment. First, the effect of risk on economic agents may manifest through its implications on decisions related to investment. For example, in a situation of heightened risk, firms and households may be opt do delay investment activities until the outlook improves. The potential of an unfavourable outcome prompts firms and households to wait. Alternatively, uncertainty about potential outcomes impels firms and households to consider the appropriate time to undertake investment. Firms are more probable to respond to an environment of uncertainty by delaying irreversible investment (Bernanke, 1983; McDonald and Siegel, 1986). Therefore, this indicates that uncertainty has a detrimental impact on investment. similarly, from the perspective of the multinational firm, the incentive to make the decision to undertake major risky foreign direct investment abroad is likely to be negatively influenced in times of elevated uncertainty. In addition, it has also been suggested that the credit constraints of firms and the cost of external finance may rise with uncertainty for the reason that uncertainty increases risk premia. (Bloom, 2014).

**Consumption** This component of aggregate demand responds to uncertainty shocks through household's inclination to increase precautionary savings in periods of elevated uncertainty. A change in risk will have an effect on the decision to consume or save. For example, household and firms facing a sudden change in interest rate costs will have to decide on whether to pursue consumption or saving options. Similarly, a country issuing debt to supplement investment or support government expenditure will be affected by a prospective hike in interest rates. In this case, the prospect of higher interest rates, may compel the country to opt to repay the debt early to avoid a higher interest rate cost burden in the future. The option for early debt repayment may necessitate an increase in production in order to generate adequate revenues. However, generating an increase in production such as hiring more workers or building factories within a limited time frame may not be feasible. Alternatively, the country may opt to lower government expenditures by decreasing consumption and investment to achieve early debt repayment. Put differently, this implies increasing exports and lowering imports which may result in reduced production in some sectors of the economy. Consequently, this reduced production may lead to less hiring or increased unemployment.

Table 4.1: Transmission channels of uncertainty effects on economic activity

| Demand side | Supply side |
|---|---|
| **Consumption** | **Labour market** |
| Uncertainty about future income- households build precautionary savings as insurance against future fluctuations in income (unemployment risk) | High uncertainty causes firms to postpone hiring and firing decisions (Bloom, 2009). Workers are also less likely to seek new jobs when uncertainty is high. |
| **Investment** | **Capital Stock** |
| Firms postpone investment due to uncertainty about sales or future profits. The value the option of delaying the investment to later rises with uncertainty.This lowers investment | When investment falls, the growth rate of capital stock is lower. This will likely restrict the amount firms can produce in the future. Consequently, firms are more reluctant to invest and take a wait and see approach |
| | **Exports** |
| | Firms uncertain about the future are more reluctant to enter new markets . This reluctance to invest or expand abroad may prevent the most productive use of resources and reduce the supply capacity of the economy. |
| | **Financial Markets and Banking Sector** |
| | *High Risk Premia* |
| | In periods of uncertainty, risk premia is high because investors and lenders require more compensation for holding risk assets as insurance. High risk premiums lower asset prices and wealth of investors. |
| | *Volatile asset prices* |
| | In periods of uncertainty, asset prices are more volatile. Lower asset prices accompanied volatile asset prices discourage investment by making borrowing more expensive. |
| | *Banking* |
| | High risk premia implies demand for greater compensation for taking risk. High macroeconomic uncertainty lowers incentive for banks to provide loans to firms and households. This may lead to tighter credit conditions, less credit available to to firms. |

### 4.2.3 Uncertainty and the business cycle

Three stylised facts related to the measures used to approximate uncertainty have emerged within the literature. First, the measures of uncertainty are correlated with real economic activity factors. Second, the measures of uncertainty are countercyclical. Third, the measures of uncertainty rise rapidly in periods of recession. Furthermore, uncertainty can be viewed as either the source or result of fluctuations in the business cycle. These three stylised facts convey that uncertainty may be either a relevant independent determinant of the business cycle or the result of other shocks but can also be a combination of both external sources of deviations as well as the reaction to changes in the business cycle (Castelnuovo et al., 2017).

Bloom (2014) identifies four theoretical mechanisms why recessions may elevate uncertainty. First, the active trading by firms in good times generates and spreads information in contrast to bad times when activity is slower, and the transmission of information declines hence elevating uncertainty. Second, forecasting is more difficult in bad times as the recessions is unknown to people. Third, when public policy is viewed as ambiguous, dynamic or both it could heighten uncertainty. Fourth, in periods of recession when business is slow, it is less costly to implement novel ideas and deploy unemployed resources to research and development. In turn this raises micro uncertainty which may translate to greater macro uncertainty. [3]

### 4.2.4 Measurement

Considering the difficulty in obtaining an objective measurement parameter for uncertainty, several subjective measurement proxies have been used within the empirical literature. Uncertainty is frequently used interchangeably with risk or in reference to a combination of both risk and uncertainty as a broader term. Predictably, this extensive definition has resulted in several alternative proxies of uncertainty (Bloom, 2014). This has resulted in the use of alternative definitions to carry out empirical estimations on the causal effects of uncertainty. Therefore, uncertainty as defined in this analysis takes the broader definition and refers to a combination of risk and uncertainty measures that have been recently used in the literature.

[3] At the micro-level, individual industries, firms and plants also respond to uncertainty. In this case the effect of effects of microeconomic uncertainty have been measured for example using dispersion of productivity shocks to firms

### 4.2.5 Capital flows and uncertainty: empirical evidence review

This section discusses the findings of empirical studies that investigate the role of uncertainty in determining different types of capital flows. Distinct concerns by policy makers, firms and consumers that will generate uncertainty and induce changes in risk aversion. This may concern uncertainty about future economic activity and the state of the economy (macroeconomic and financial) or prospects for the economic outlook. Alternatively, it may be concern about the evolution of economic policy or public policy within a country. For example, this could be related to concerns that will affect institutions, the legal and regulatory framework, political risks-elections, government stability, corruption, expropriation- macro-prudential policy-capital controls, macroeconomic policy stance-monetary policy (interest rate changes) or fiscal policy (tax changes).

A summary of analysis of the link between aggregate capital flows and its different components with uncertainty is presented in Table 4.2. This table presents an overview of various empirical studies in terms of country samples, time periods, type of capital flow, aspects of uncertainty considered and the main results. The majority of the empirical studies analysing the effect of uncertainty on capital flows provide supportive evidence of uncertainty having significant effects on capital flows. This implies that uncertainty in its different aspects, as defined by various proxies, is a relevant driver for capital flows. However, a limited number of studies do not find uncertainty to matter for capital flows.

Bianco and Loan (2017) conclude that macroeconomic uncertainty proxied by price volatility does not have a significant effect on foreign direct investment with exchange rate volatility having a negative and significant effect. Similarly, Cai et al. (2018) find that investors are not deterred from investing in developing countries with higher risk as proxied by sovereign credit ratings. Investors exhibit less risk aversion when investing in riskier developing countries. Their findings suggest that greater inflows go to developing countries with lower credit ratings. However, Kellard et al. (2018) argue that sovereign risk is a more appropriate measure as it is based on a broad range of macroeconomic vulnerabilities and not only financial market risk captured through the sovereign credit ratings. Alternatively, foreign direct investment flows could potentially be driven by other factors in the host country such as natural resource endowments that would provide the incentive for multinational corporations to invest.

### Global and country-specific uncertainty

Distinguishing between country-specific and global uncertainty, empirical studies show that idiosyncratic uncertainty is more relevant than aggregate uncertainty (Noria and Fernandez, 2018; Schmidt and Zwick, 2015). Noria and Fernandez (2018) investigate the effect of uncertainty on foreign direct investment flows for the manufacturing sector in Mexico between 2007-2015. Using uncertainty proxied based on the expectations of entrepreneurs and forecasters regarding manufacturing sub-sectors and the economic outlook for Mexico they show that uncertainty deters foreign direct investment going into the manufacturing sector in Mexico. This idiosyncratic measure of uncertainty performs better than the proxy for aggregate uncertainty , underscoring the importance of country-specific uncertainty. Moreover, these findings align with the theoretical proposition and empirical evidence of irreversibility of investment. Although, global uncertainty-measured by the VIX-has been shown to be a relevant push factor for cross-border capital flows, limited studies assess the role of country-specific uncertainty on cross border capital flows Choi and Furceri (2019).

Owing to its greater coverage and availability for advanced economies compared to emerging markets, studies focusing on source country uncertainty effects such as Gauvin et al. (2014), largely make use of news-based measures to measure uncertainty. A prevalent news-based measure often used within the empirical literature to proxy uncertainty about economic policy is the Economic Policy uncertainty (EPU) index by Baker et al. (2016). On the other hand, studies on emerging market and developing countries use proxies for country-specific risk based on observable measures of uncertainty. In these studies, idiosyncratic risk has been approximated using measures encompassing financial uncertainty (stock market volatility, financial stability risks), political-related risk (expropriation, corruption, rule of law, elections),fiscal-related uncertainty (tax rate volatility).

### Aggregate capital flows and subcomponents

The examination of individual types as well as aggregate capital flows concur and provide evidence supportive of the negative and significant effects of uncertainty. Specifically, this has been found for on gross inflows, gross outflows and net inflows (Gourio et al., 2016). Similar detrimental effects are confirmed by Schmidt and Zwick (2015) for aggregate capital flows to 12 Euro area countries. Furthermore, the relevance of the distinct characteristics of each type of capital flow in responding to economic shocks has also been found. Hlaing and Kakinaka (2019), find that in periods of heightened

global uncertainty (measured by the VIX), the likelihood of a contraction in portfolio investment is high for both advanced and developing countries whereas the probability of a sudden stop in foreign direct investment to developing countries is less likely. They opine that this corroborates with prior evidence from the literature which asserts that portfolio investment and bank flows are more easily reversible in comparison to foreign direct investment flows which tend to be more stable and long-term in nature. Therefore, this distinct response may arise because the determinants of foreign direct investment are not the same as those the other two type of cross-border capital flows (portfolio and bank flows). This further aligns with literature on the investment decision for multinational corporations' engagement in foreign direct investment identified as being driven by different incentives including trade, corporate taxation, bilateral relations, exchange rate and other gravity variables.

**Bilateral Flows**

It has been argued that using aggregate-level capital flows does not permit the proper identification of country-specific uncertainty effect (Choi and Furceri, 2019). The use of a subset of aggregate level capital flows such as foreign direct investment flows recorded at the bilateral level, enable the disentangling of the effects of country-specific uncertainty (risk aversion) from source and host countries. Owing to the structure of these bilateral datasets, a strand of the empirical literature explores the dual effects of uncertainty and risk from origin and destination countries. Recent studies use bilateral data on foreign direct investment and bank flows to investigate the response of these flows to uncertainty and risk.

Empirical studies using bilateral data reveal a negative effect of uncertainty on foreign direct investment flows. Kellard et al. (2018) finds a negative effect of risk (identified as sovereign and financial stability) on bilateral foreign direct investment. Similarly, Wang (2018) and Choi and Furceri (2019) find evidence of negative effects of uncertainty-proxied by stock market volatility-on bilateral bank flows.

Notably, while these studies use bilateral data, there are variations in the empirical strategy. For example, Kellard et al. (2018) use bilateral foreign direct investment data to estimate equations for the effects of (country and financial stability) risks on foreign direct investment for source and host countries in two separate specifications and not simultaneously. Whereas, Choi and Furceri (2019) use bilateral data but only control for host country time fixed effects and use time-varying determinants for the supply conditions in the source country only. Choi and Furceri (2019) opt for the choice to solely control for recipient country time fixed effects and argue that

it maximises the sample coverage overcoming the challenge arising from the limited availability of macroeconomic control variables for the host countries (largely emerging markets)in the sample, at a quarterly frequency. On the other hand, to control for unobserved country-specific characteristics, Wang (2018) controls for both source and host country fixed effects. Cai et al. (2018) take a similar approach to Wang (2018) and find that multinational corporations have different risk attitudes regarding investing in developed and developing countries. Source countries with better credit ratings have lower outward foreign direct investment. While OECD countries with better ratings receive higher inflows, non-OECD countries with lower ratings also receive higher inflows. This may suggest that investors prefer the high-risk environment in developing countries or alternatively multinational corporations are less risk averse and enter developing countries in search of high yields. This may be due to other factors providing incentives or more favourable conditions to multinational corporations such as tax breaks making them more attractive for foreign direct investment.

**Developed and developing countries**

Uncertainty has different effects on capital flows based on the perceived riskiness or country risk when countries are distinguished based on the level of development. Specifically, while a majority of the empirical studies find that uncertainty deters capital flows, it has been found that higher risk in developing host countries does not deter investors from undertaking foreign direct investment (Cai et al., 2018). This evidence suggests that investors are not deterred by the environment of higher risk present in developing countries. On the other hand, source country results indicate contrasting results with investors exhibiting greater risk aversion toward investing in high income countries. Similarly, political-related uncertainty has been found to have a differential effect on developed and developing countries. This has led to the development of a strand of literature using elections as a measure of uncertainty. It has been shown that elections influence capital flows by creating uncertainty about the future government policies. This uncertainty in turn affects the decision-making of forward-looking agents. Honig (2019) finds that uncertainty arising from elections is more relevant for foreign direct investment going to developing countries than developed countries. Conversely, elections have no significant effects on portfolio equity and debt flows in both developed and developing countries. This result suggests that foreign direct investment is more sensitive to uncertainty regarding future government policy considering it is the most irreversible form of capital flow among the three.

Similar evidence has been found regarding macroeconomic uncertainty. The foregoing findings align with evidence showing that developing countries having greater

uncertainty than developed countries. Countries in regions with lower incomes experience greater volatilities in stock markets, exchange rates and GDP growth rates and are exposed to higher macroeconomic uncertainty which can be explained by three mechanisms (Bloom, 2014). First, the lack of diversification and reliance on exports of limited goods in developing countries makes them more susceptible to changes in output and price. Second, the main exports of developing countries such as commodities have highly variable prices. Third, developing countries tend to have more political disturbances such as coups, wars and revolutions; are more vulnerable to natural disasters such as floods and epidemics and have weaker fiscal and monetary policies.

### Extreme waves of capital flows

Empirical evidence has also shown the role of uncertainty in generating fluctuations in capital flows. Extreme waves of capital or episodes of capital flows namely surges, stops, retrenchment and capital flight have been linked to uncertainty. Moreover, the sensitivity of the different capital flows varies. Due to their distinct nature and behaviour, some types of capital flows are more responsive to uncertainty. Hlaing and Kakinaka (2019) find that uncertainty elevates the probability of a sudden stop in portfolio investment whereas foreign direct investment is more stable and less reversible in periods of heightened global uncertainty. Both global and country-specific uncertainty are relevant for sudden stops and retrenchment in gross capital flows in the 12 Euro Area countries and uncertainty elevated home bias among investors (Schmidt and Zwick, 2015). Fluctuations in financial flows have been linked to the risk aversion of foreign investors. The attitudes of investors or lenders tend to trigger risk-on and risk-off episodes which may induce waves of extreme capital flows. Therefore, underlying fluctuations in capital flows may be the result of the shifting attitudes of investors responsiveness to information asymmetry and other factors influencing the decision to engage with the destination countries. Accordingly, investors aversion to uncertainty has been shown to be a driver of major shifts in capital flows especially portfolio and debt flows. Rey (2015) highlights the relevance of global uncertainty and risk aversion in driving capital flows, asset prices and credit growth. Furthermore, factors driving both uncertainty and risk aversion include macroeconomic fundamentals, funding conditions, risk attitudes of lenders and foreign investors and the monetary policy stance in financial centre economies (Cerutti et al., 2014).

Table 4.2: Summary of recent studies on the impact of uncertainty and risk on capital flows

| Author (s) | Sample | Aspects considered & measure used | Capital Flow & source | Main Result |
|---|---|---|---|---|
| Noria and Fernandez (2018) | Manufacturing sector in Mexico, 2007-2015 | Expectations of entrepreneurs/forecasters (Bank of Mexico forecasters survey and country monthly business survey) | foreign direct investment at 3 digit manufacturing sector (Bank of Mexico) | Uncertainty deters foreign direct investment to the manufacturing sector. Idiosyncratic measure of uncertainty performs better than the proxy for aggregate uncertainty. |
| Solomon and Ruiz (2012) | 28 developing countries, 1985-2004 | Political Risk (International Country Risk Guide) & Exchange rate uncertainty | FDI (World Development Indicators) | Economic uncertainty measured as political risk and exchange rate uncertainty have a negative and significant effects on FDI |
| Hlaing and Kakinaka (2019) | 57 countries, 2000-2015 | Global Uncertainty (VIX) | FDI, Portfolio Investment & Other Investment; (IMF BOP) | Uncertainty increases the likelihood of sudden contraction in Portfolio investment in both advanced and developing economies. In times of high global uncertainty, FDI is more stable for developing countries |
| Gourio et al. (2016) | 26 developing countries, 1970-2011 | Country-specific stock market return volatility | Gross Inflows, Gross Outflows & Net Capital Flows; (IMF IFS) | Economic uncertainty through the volatility of stock market returns reduces gross capital inflows and outflows. It is associated with political risk, rising political risk is linked to decline in capital inflows and deterioration in economic conditions |
| Schmidt and Zwick (2015) | 12 Euro Area countries, 1991-2012 | VIX (Chicago Board Options Exchange), Interest rate spread, Economic Sentiment (Survey based), time varying conditional variance (GARCH models used to get uncertainty proxies for industrial production, inflation and national stock market indices) | Total flows, Portfolio flows & FDI Flows; (IMF Balance of payments statistics) | Country-specific uncertainty is relevant in predicting extreme capital flow episodes. High uncertainty and high risk aversion, increase home bias due and safe haven effect found. |
| Kellard et al. (2018) | 112 source countries & 16 Euro Area host countries, 2009-2016 | *Country Risk:* 10-year Sovereign Bond Yields *Banking Risk:* Regulatory Capital/Risk-Weighted Assets, Bank z-score, Non-performing loans/Total Gross Loans; | Bilateral FDI flows ;(IMF CDIS) | Source country financial stability risk conditions-sovereign and banking risks-are more relevant for the multinational corporation's foreign direct investment decision. Both sovereign and banking risks for source countries are negative and significant |
| Julio and Yook (2016) | 43 countries-US firms to foreign affiliates, 1994-2010 | Political Uncertainty: timing of national elections dummy (host country) | FDI flows ;(Bureau of Economic Analysis) | Political uncertainty has negative and significant impact on FDI |
| Wang (2018) | 24 source countries & 84 host countries, 1984-2015 | Stock market volatility | Bilateral bank flows ;Bank for international settlements locational banking statistics (BIS LBS) | Banks lower outward lending when host country becomes risky. They also increase exposure at home in periods of high uncertainty. |
| Choi and Furceri (2019) | 25 source countries & 50 host countries, 1990-2012 | Stock market volatility Economic Policy Uncertainty (EPU) index Baker et al. (2016) | Bilateral bank flows ;Bank for international settlements locational banking statistics (BIS LBS) data | Country-specific uncertainty lowers cross-border lending and borrowing by banks. |
| Honig (2019) | 104 Countries, 1984-2016 | Political Risk: elections | FDI, Portfolio(Debt and Equity) flows ;(IMF IFS) | Elections have a negative significant effect on FDI flows in developing countries but this does not hold for portfolio equity and debt flows. |
| Cai et al. (2018) | 31(OECD) source countries & 72 (OECD & non-OECD)host countries; 1985-2012 | Sovereign credit ratings scores (Standard & Poor's,Fitch & Moody's) | Bilateral FDI flows ;(OECD) | For host countries, higher credit ratings attract more inflows. Lower ratings or high risk host countries. For source countries, sovereign credit ratings reduce FDI outflows |
| Bianco and Loan (2017) | 10 Latin American and Caribbean countries; 1990-2012 | Price volatility(GARCH) & Real exchange rate volatility(GARCH), (WDI) | FDI inflows ;(UNCTAD) | Exchange rate volatility has a negative and significant impact on FDI. Price volatility has a positive but no significant effect on FDI. |
| Gauvin et al. (2014) | 20 Emerging markets countries; 2004-2011 | Economic Policy Uncertainty (US & UK), Baker et al. (2016) | Portfolio (Equity & Bond) Flows ;(EPFR Global) | Policy uncertainty in the US diminishes equity and bond flows. Policy uncertainty in the EU had a negative effect on bonds and a positive effect on equity. |

## 4.3 Data and descriptive statistics

### Foreign direct investment bilateral flows

Data on cross-border direct investment from the Organisation for Economic Co-operation and Development (OECD) is the main source for bilateral foreign direct investment outflows used in the analysis. The data used covers bilateral foreign direct investment flows for the period 2000 to 2013. The country sample selection is based on data availability. If a source country contains no record of data for a specific host country in any period, the bilateral foreign direct investment is assumed to be zero. Furthermore, entries of negative foreign direct investment between country-pairs in the sample are set to zero. Unlike Choi and Furceri (2019) who drop flows of less than $5 million and negative observations and control for outliers by winsorising the dependent variable. The study assumes that bilateral foreign direct investment flows depends on the economic uncertainty in both the source and host country. Throughout the analysis, offshore financial centres or tax havens are excluded.

### Uncertainty

#### Financial Uncertainty

Stock market volatility is used to proxy for uncertainty following Choi and Furceri (2019) and Wang (2018). This proxy is obtained from the World Bank Global Financial Development Database (GFDD) and is measured on an annual basis. It is the average of the 360-day standard deviation of the country stock market index. Stock market volatility can be viewed as realised volatility. Since implied volatility consists of forward-looking information it is preferred to realised volatility. However, Choi et al. (2018) suggests that when measured on an annual basis the variation between implied and realised volatility is small. Often used in the literature, stock market volatility is viewed as a feasible observable market based and real-time measure for economic uncertainty (Bloom, 2009; Gourio et al., 2016; Choi et al., 2018). Furthermore, this proxy for economic uncertainty is chosen owing to its availability over a long time period and for a large number of countries (Wang, 2018). Consequently, it provides a proxy for country-specific uncertainty for a large number of countries. [4]

[4]Measures of uncertainty based on data obtained from consumer or firm surveys are inevitably not equivalent across countries, while cross-sectional proxies capturing dispersion of firm-level sales, employment and productivity tend to be available for a shorter timespan (Choi and Furceri, 2019).

While the global financial crisis led to a decline in foreign direct investment inflows, it led to increasing recognition of financial sector vulnerability (e.g. systemic banking crisis) and sustainability of government debt (e.g. Euro Debt crisis) issues by investors (Kellard et al., 2018). The stability of the financial sector may also be relevant for the foreign direct investment choices by multinational corporations (Kellard et al., 2018). Following Kellard et al. (2018) I evaluate the role of a fragile banking sector for foreign direct investment. This is done using three banking risk measures commonly used in the literature to measure the stability of the banking sector. All three banking risk measures are obtained from the World Bank Global Financial Development database.

Regulatory Capital to Risk-Weighted Assets measures the core capital allocated by a country's banking sector to buffer risky assets. This measure reflects the efforts by policymakers to tackle risk-taking by banks by requiring higher capital buffers (Kellard et al., 2018).

Additionally, the Bank Z-score is used to measure bank risk. The Bank Z-score has been used to account for financial distress in banks and is used to forecast the likelihood of banking system default in a country. The Bank Z-score is computed as the ratio of country's banking system (capitalization and returns) to the volatility of those returns. [5] The greater the Bank Z-score, the greater the volume of capital available to banks to manage market risk and the lower the default risk.

Lastly, another measure of the outstanding risk of banks used is the non-performing loans over total gross loans (NPL ratio). Non-performing loans impact the bank lending to the private sector through three channels; profitability, capital and funding costs. Profitability of banks is affected as non-performing loans result in less income generation and more provisions and therefore lower bank net income. In terms of capital, the existence of non-performing loans necessitates a greater capital allocation by banks. Whereas, funding costs increase owing to banks' impaired balance sheets. The effect of high non-performing loans on lending to the private sector is more pronounced in countries more dependent on bank financing as credit becomes less accessible and costlier.

### Political Risk and Political Uncertainty

The investment profile is used to proxy expropriation risk. This is obtained from the International Country Risk Guide (ICRG). The underlying components of this com-

[5] It is estimated as (ROA+(equity/assets))/sd(ROA); sd(ROA) is the standard deviation of ROA. Return on assets(ROA), equity, and assets are country-level aggregate figures calculated from underlying bank-by-bank unconsolidated data from Bankscope.

posite variable capture country risk related to contract viability, expropriation, profits repatriation and payment delays. It takes values between 0-12, where higher values indicate lower risk. The international country risk guide contains data on 140 countries commencing from 1984. Local and foreign investors will have heterogeneous exposure to risks due to government policies that will implicitly or explicitly differentiate between resident and non-resident investors (Gourio et al., 2016). A probable factor that may explain the movements of flows is expropriation risk. Gourio et al. (2016) highlight that foreign investors in comparison to their domestic counterparts are more susceptible to expropriation risk. This is risk posed by government policies that either directly or indirectly make a distinction between foreign and domestic investors. Such policies may comprise the imposition of capital controls, taxation on foreign transactions, delayed payments, partial defaults or any form of expropriation risk the foreign investor could potentially encounter when engaging in cross-border investment. Therefore, host country economic uncertainty (or volatility) may be relevant for a country as it increases the probability of an improper political (policy) reaction (Gourio et al., 2016). Therefore, country (policy)risk may have a role in the pattern of bilateral flows.

**Macroeconomic Uncertainty**

Macroeconomic uncertainty proxied by the real exchange rate and price volatility. Macroeconomic instability as a result of uncertainty in the foreign exchange market may be relevant for motivations of the multinational corporation investing abroad. The exchange rate may deter multinational corporations from undertaking investment to avert changes in the terms of trade. A negative association between foreign direct investment and the exchange rate may occur if the motive of the multinational corporation is to provide for alternative markets or to export products back to the home country. The *hysteresis* and *real option value* theories suggest that uncertainty will have a negative impact on foreign direct investment, leading to multinational corporations postponing entry because uncertainty raises the option value of waiting (Bianco and Loan, 2017). According to the *production flexibility theory*, uncertainty will enhance foreign direct investment. This will result in uncertainty having a positive effect on foreign direct investment. A positive response of foreign direct investment to exchange rate uncertainty may arise if the motive of the multinational corporation is to enhance its market share by entering other locations and to have the opportunity of production flexibility (Solomon and Ruiz, 2012). On the other hand, macroeconomic stability resulting from domestic price volatility or inflation uncertainty will affect foreign direct investment (Bianco and Loan, 2017).

### Policy Uncertainty

In line with previous empirical literature, the newspaper-based measures Economic policy uncertainty (EPU) created by Baker et al. (2016) is used to account for policy uncertainty. The index captures uncertainty concerning "who will make economic policy decisions, what economic policy decisions will be undertaken and when they will be enacted, the effects of past, present and future policy actions, and uncertainty induced by policy inaction." (pp.1598). Using the EPU index which covers mostly advanced economies and a limited number of emerging market economies the role of policy uncertainty has been investigated in various spheres. For mergers and acquisitions (M&A) type of FDI, Bonaime et al. (2018) find that economic policy uncertainty about government policies exerts a negative impact on the mergers and acquisitions activity of multinational corporations both at the aggregate and firm-level. A similar conclusion is drawn from the empirical analysis of Nguyen and Phan (2017) who find that multinational corporations take longer to finalise mergers and acquisitions deals when there is greater uncertainty. Therefore, aligning with this prior literature this analysis examines the effects of policy uncertainty on aggregate foreign direct investment data which includes both greenfield and mergers and acquisitions.

## Other determinants of Foreign Direct Investment

Bilateral factors are used to account for information frictions between a pair of source-host countries. Distance between countries is used to measure information costs (Portes and Rey, 2005b). Distance is captured as the geographical distance between capital cities in source and host countries. On the assumption that information asymmetries will be more enhanced the more distant countries are flows would be more fickle, the greater the distance between countries. Hence, it is expected for distance to exert a negative effect. Common border is included as an additional measure to account for the inherent cost of information asymmetry is whether or not source country $i$ and host country $j$ shares a common border. The contiguity variable represents how proximity between country-pairs may determine whether vertical or horizontal foreign direct investment takes place. Similarly, sharing of a common language between country source $i$ and host country $j$ to capture the ease of doing business between country-pairs is included. It is anticipated that the cost of doing business will be less between countries that share a common language. Therefore, common language is anticipated to have a positive effect on bilateral flows. This common language variable accounts for the information frictions or asymmetries between external and local investors. The existence of a common currency between source country $i$ and host country $j$ is controlled for

to further account for transaction costs. The presence of a common currency between source country $i$ and host country $j$ is anticipated to be advantageous for bilateral flows as it signifies that external investors do not encounter exchange rate risk. Dummy variables are used to model whether a pair of source and host countries share a common border, a common language and common currency. The bilateral factors distance, contiguity, common language and common currency are bilateral time-invariant variables obtained from the Gravity database.[6]

Gross Domestic Product to capture the size of the economy is included. This is measured using gross domestic product (GDP). Motivated by previous literature the specification includes the logarithm of GDP for country and market size. A positive effect would suggest that higher levels of GDP in source country $i$ would enhance foreign direct investment seeking to expand into new markets as it reflects high income and greater capacity of firms to invest abroad. Conversely, lower GDP in source country $i$ would signify restricted domestic markets which could compel firms to enter external markets (Hattari and Rajan, 2009; Jongwanich et al., 2013). Alternatively, higher levels of GDP in host country $j$ may suggest greater income and purchasing power of customers in the host country. Wang (2018) argues that higher income may also infer the extent of information frictions, on the premise that, the ease with which investors from source country $i$ can access information will be better for larger economies comparative to smaller ones.

Bilateral trade flows for trade between country-pairs is controlled for as it may affect foreign direct investment flows at the bilateral level. It captures the influence of trade on foreign direct investment. This is also important because the financial account and the current account are closely related due to the accounting identity, (Choi and Furceri, 2019). This data is obtained from the IMF Direction of Trade (DOT) Statistics.

Tax at the corporate level in the host country is included. This is included as the log of corporate income tax. Corporate tax represents the host country average corporate tax rate. This may be relevant for foreign direct investment as it affects profits of foreign firms' investments. Higher corporate income tax is expected to deter foreign direct investment. The relevance of lower corporate tax rates in driving foreign direct investment has been found for emerging markets, (Arbatli, 2011). This implies that the motive of firms to invest in host countries is impacted by the level of the corporate income tax rate in the host country. For this reason, lower corporate income tax rates in destination countries will provide more incentive for multinational corporations

[6]Available from Centre d'Etudes Prospectives et d'Informations Internationales (CEPII): www.cepii.org

to invest (Di Giovanni, 2005). Host country corporate tax data are obtained from KPMG corporate tax survey, augmented with data from Ernst and Young Worldwide Corporate tax guide.

Infrastructure in the host country is an important determinant for attracting foreign direct investment to countries, (Asiedu, 2002; Kinda, 2010). Infrastructure quality in the host country is proxied by the sum of fixed-line telephone and mobile subscribers per 1,000 population, obtained from the World Development Indicators (WDI). It is anticipated that the quality of physical infrastructure in the host country will have a positive effect on foreign direct investment. The efficiency of investments will be enhanced with better infrastructure and this drive efficiency-seeking foreign direct investment to host countries.

Table 4.3: Summary statistics

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| FDI | 25367 | 547.493 | 3121.368 | 0 | 172210.1 |
| Stock vol_Source | 27742 | 3.007 | .412 | 1.927 | 4.595 |
| Stock vol_Host | 27742 | 3.007 | .489 | .873 | 4.953 |
| ln GDP_Source | 23029 | 23.334 | 1.811 | 18.66 | 30.553 |
| ln GDP_Host | 19765 | 22.873 | 1.899 | 17.23 | 30.523 |
| ln Distance | 27407 | 8.395 | 1.013 | 4.742 | 9.88 |
| Common Border | 27407 | .04 | .197 | 0 | 1 |
| Common Language | 27407 | .062 | .241 | 0 | 1 |
| Common Currency | 27407 | .01 | .099 | 0 | 1 |
| ln Trade | 14429 | 18.684 | 2.566 | -19.408 | 25.573 |
| ln Infrastructure | 27716 | 4.429 | .963 | -1.004 | 5.795 |
| ln Tax | 26390 | -1.285 | .348 | -2.408 | -.483 |
| ln Population | 17016 | 2.733 | 1.582 | -2.94 | 7.222 |
| Non-performing loans_source | 11036 | 1.095 | .919 | -2.503 | 3.147 |
| Non-performing loans_host | 9996 | 1.295 | .878 | -2.503 | 3.618 |
| Regulatory capital_source | 23571 | 2.568 | .198 | 1.946 | 3.431 |
| Regulatory capital_host | 21753 | 2.647 | .241 | .562 | 3.431 |
| Bank Z-score_source | 25328 | 2.289 | .82 | -4.109 | 3.638 |
| Bank Z-score_*host* | 25158 | 2.415 | .753 | -4.109 | 4.557 |

Table 4.3 provides the summary statistics of the variables used in the empirical analysis. Table 4.4 provides the correlation matrix of the independent variables to be used in the regressions. Pair-wise correlations among the variables are small.

Table 4.4: Correlation matrix of regression variables

| Variables | Stock vol_Source | Stock vol_Host | ln GDP_Source | ln GDP_Host | ln Distance | Common Border | Common Language | Common Currency | ln Trade | ln Infrastructure | ln Tax | ln Population |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stock vol_Source | 1.000 | | | | | | | | | | | |
| Stock vol_Host | 0.229 | 1.000 | | | | | | | | | | |
| ln GDP_Source | -0.022 | 0.031 | 1.000 | | | | | | | | | |
| ln GDP_Host | -0.027 | 0.081 | 0.293 | 1.000 | | | | | | | | |
| ln Distance | -0.117 | -0.046 | 0.002 | -0.100 | 1.000 | | | | | | | |
| Common Border | 0.024 | 0.027 | 0.051 | 0.108 | -0.412 | 1.000 | | | | | | |
| Common Language | -0.116 | -0.088 | 0.104 | 0.084 | 0.068 | 0.136 | 1.000 | | | | | |
| Common Currency | -0.049 | -0.068 | 0.011 | 0.010 | 0.029 | 0.002 | 0.283 | 1.000 | | | | |
| ln Trade | 0.039 | 0.084 | 0.371 | 0.437 | -0.281 | 0.207 | 0.073 | -0.019 | 1.000 | | | |
| ln Infrastructure | 0.130 | -0.128 | -0.107 | 0.065 | -0.220 | 0.073 | -0.037 | 0.005 | 0.061 | 1.000 | | |
| ln Tax | -0.098 | 0.020 | 0.079 | 0.356 | 0.166 | 0.012 | 0.094 | 0.021 | 0.235 | -0.302 | 1.000 | |
| ln Population | -0.028 | 0.282 | 0.056 | 0.686 | 0.050 | 0.036 | 0.008 | -0.045 | 0.425 | -0.286 | 0.423 | 1.000 |

## 4.4 Methodology

The empirical analysis uses the gravity model which has been used in the literature in examining international trade and capital flows. The empirical investigation of determinants of foreign direct investment considers that the magnitude in investment reflect both push (supply-side) and pull(demand-side) factors as investment responds to changes in macroeconomic developments including changes in uncertainty. Furthermore, the expected return and risk of investment project will be influenced by uncertainty.

This investigation uses the bilateral structure of the foreign direct investment flow data to account for unobserved time-variant factors. This strategy provides a way to identify the role of uncertainty in the source and host country as drivers (push and pull factors) of cross-border direct investment flows. Therefore, unlike Kellard et al. (2018) who estimate a separate equation for the source and host country respectively, the dual effects of source and host country uncertainty are estimated for each proxy. Considering the dual effects of source and host country uncertainty is similar to the strategy adopted in Wang (2018) who investigates the role of stock market volatility on cross-border bank flows and Cai et al. (2018) on the role of sovereign credit ratings on foreign direct investment flows.

To examine the effect of higher uncertainty in both the origin and destination country in determining cross-border foreign direct investment flows the following is estimated:

$$FDI_{i,j,t} = \alpha Unct_{i,t-1} + \beta Unct_{j,t-1} + \gamma X_{i,j,t-1} + \lambda_i + \lambda_j + \phi_t + \varepsilon_{i,j,t} \qquad (4.1)$$

where $i$ is the source (origin/reporting) country of the multinational corporation and $j$ denotes the host (destination/counterpart) country and $t$ indicates time.

$FDI_{i,j,t}$ is the dependent variable and denotes the level of annual bilateral foreign direct investment flow from source country $i$ to host country $j$ in levels in year $t$ following Cai et al. (2018). $FDI_{i,j,t}$ can be explained as an outflow from country $i$ or inflow into country $j$.

$Unct_i$ and $Unct_j$ are proxies the origin country $i$ and host country $j$ uncertainty respectively. The estimated effects of $Unct_i$ and $Unct_j$ on $FDI_{i,j,t}$ represent the outflow and inflow movement in response to economic uncertainty concurrently in both

origin and recipient country. [7] Domestic investors (multinational corporation in origin country) may respond to local and external uncertainty differently. Therefore, $\alpha$ and $\beta$ estimates described in equation (4.1) may take the following signs:

$\alpha > 0$ An increase in the uncertainty in source country $i$ increases outflows to host country $j$ by $\alpha$. Local investors in source country $i$ respond to higher domestic uncertainty by increasing exposure to host country $j$. This characterises the response of local investors in source country $i$ to the domestic shock at home. This implies an increase in outflows or flight. [8]

$\alpha < 0$ An increase in the uncertainty in source country $i$ reduces outflows to host country $j$ by $\alpha$. Local investors in source country $i$ respond to rising domestic uncertainty by reducing exposure to host country $j$. This characterises the response of local investors in source country $i$ to the domestic shock at home. This implies a reduction in outflows or retrenchment.

$\beta > 0$ An increase in uncertainty in host country $j$ increases inflows to country $j$ by $\beta$. Local investors in source country $i$ respond to heightened uncertainty in host country $j$ by increasing exposure to country $j$. This characterises the response of local investors in source country $i$, to the external shock in host country $j$. This implies an expansion or surge in inflows.

$\beta < 0$ A rise in the uncertainty of host country $j$ reduces inflows to country $j$ by $\beta$. Local investors in source country $i$ respond to elevated uncertainty in host country $j$ by reducing exposure to country $j$. This characterises the response of local investors in source country $i$, to the external shock in host country $j$. This implies a reduction or stops in inflows.

$X_{i,j,t-1}$ is a set of macroeconomic, bilateral factors capturing different aspects of

[7] In Wang (2018) cross-border bank flows and uncertainty are considered and it is hypothesised that since empirical evidence illustrates a positive correlation and pro-cyclical movement in capital inflows and outflows (Broner et al., 2013; David et al., 2015) domestic investors respond to heightened domestic and foreign by taking the same signs $\alpha < 0$ and $\beta < 0$. An increase in source country $i$ uncertainty decreases outward flows while an increase in recipient country $j$'s uncertainty reduces inflows to country $j$. A retrenchment in outflows is accompanied by a stop in inflows in response to heightened uncertainty at home and abroad respectively.

[8] Forbes and Warnock (2012) identify four distinct episodes concerning the movement of cross-border capital flows. *Flight*: a sharp increase in gross capital outflows; *Retrenchment*: a sharp decrease in gross capital outflows; *Surge*: a sharp increase in gross capital inflows and *Stops*: a sharp decrease in gross capital inflows.

foreign direct investment choices by multinational corporations as previously described in section 4.3.

$\lambda i$ and $\lambda_j$ represent the source country and host country fixed effects. The $\lambda_{i,j}$ represents the country-pair fixed effects. Whereas, $\phi_t$ represents year fixed effects to control for global factors and general economic trend. Alternative variations of the model will be estimated considering the various fixed effects with year fixed effects $\phi_t$ included in all the various specifications. The bilateral feature of the data makes it possible to assess the distinct effects of source country and host country factors and to control for observed and unobserved country-specific and country-pair factors. In comparison to conventional approaches employed in the literature, this bilateral aspect of foreign direct investment data allows for an improved determination in the effects, (Kellard et al., 2018).

## 4.5 Empirical Findings

### 4.5.1 Main Results

This section provides the key empirical findings. Although a few studies examine the effects of uncertainty and risk in driving bilateral bank flows (Choi and Furceri, 2019; Wang, 2018) and bilateral foreign direct investment flows (Cai et al., 2018; Kellard et al., 2018) none of them considers the effects of different types of uncertainty. More specifically, these studies consider the role of uncertainty and risks using proxies pertaining to financial aspects including stock market volatility (Choi and Furceri, 2019; Wang, 2018), sovereign risk and financial stability risk (Kellard et al., 2018) and sovereign credit ratings (Cai et al., 2018).

#### Financial Uncertainty

The result from the estimation of equation (4.1) using uncertainty and risk measures regarding financial markets are presented. Uncertainty is captured by stock market volatility and bank-related risk measures along with standard determinants of foreign direct investment are presented. Equation (4.1) is estimated using time, source country and host country fixed effects. In the first column of table 4.5 reports the main financial uncertainty proxy variable, stock market volatility. In subsequent columns (2)-(5), other measures of bank-related risk namely non-performing loans (NPL), regulatory

capital to risk weighted assets and the bank Z-score are presented. Finally, the results from an index of financial uncertainty derived from principal component analysis of the four are presented in the last column.

Results obtained by estimating equation 4.1 using stock market volatility in column (1) reveal that higher uncertainty in the source country measured by stock market volatility has no effect on foreign direct investment outflows. This result does not support the proposition that multinational corporations reduce outflows abroad when it becomes more risky at home. Contrastingly, there is a negative impact of host country stock market volatility on foreign direct investment inflows. This shows evidence that higher financial uncertainty is statistically significant and has a negative effect for destination country foreign direct investment inflows. Heightened uncertainty in recipient countries results in multinational corporations reducing investment flows. This is consistent with the hypothesis that more stable countries will attract more inflows.

However, considering other proxies measuring risk in financial markets, the host country effect maintains a negative effect although this result is not always statistically significant across the specifications. The banking sector related risk proxies are presented in column (2)-(4). Using the non-performing loans ratio as a financial stability risk measure provides similar results to stock market volatility proxy in column (1). The host country financial stability risk proxied by non-performing loans shows strong evidence of reduction in capital inflows at the 1% level. An increase in non-performing loans ratio is associated with lower foreign direct investment flows. Whereas, the source country does not appear to affect bilateral foreign direct investment.

On the other hand, the coefficient for regulatory capital in table 4.5 has a negative sign however it is not statistically significant in both origin and destination country. This does not support the hypothesis that an increase in the regulatory capital holding by banks will translate into a reduction in the availability of credit in the source country to multinational corporations investing abroad where there is a higher incidence of imperfect knowledge as established by Kellard et al. (2018).

The bank z-score provides a contrasting result, higher bank risk in the source country results in an increase in foreign direct investment outflows. This suggests that the source country risk environment is more important than the host country.

Finally, $Fin_{index}$ represent indices (source and host country) obtained from a principal component analysis of the prior financial uncertainty and risk variables in columns (1)-(4). In contrast to prior results, only the source country coefficient is statistically significant and has a negative sign. This suggests risk and uncertainty regarding finan-

cial markets in source countries is more relevant for firms' decisions to invest abroad and gives evidence of the role of the financial sector in cross-border investment.

Considering table 4.5, among the gravity variables only distance, the common language variable is statistically significant. Aligning with previous literature, common language and distance as proxies for information and transaction costs are important determinants of financial flows (Portes and Rey, 2005b). Distance lowers bilateral flows significantly whereas the existence of common language facilitates bilateral flows between country-pairs.

Overall the results for uncertainty regarding financial markets provide varied results. Host country uncertainty regarding financial markets appears to have a larger impact on bilateral foreign direct investment flow than source country uncertainty in most specifications. However, this outcome is not statistically significant across specifications, the host country coeficient is larger than source country coefficient when proxied by stock market volatility, non-performing loans and regulatory capital. The source country financial situation is relevant for foreign direct investment decisions when the Bank Z-Score and the financial uncertainty index are used as proxies albeit with contrasting signs. The latter is partly consistent by the conclusion made by Kellard et al. (2018) that source country risk matters more and will exert a negative effect. Therefore, the results for uncertainty and risk regrading financial markets suggest that the financial situation in the host country is relevant in attracting foreign direct investment and contrasts with the proposition that financial institutions in the host country are irrelevant to multinational corporations.

Table 4.5: Bilateral foreign direct investment, financial risk and uncertainty

| | Stock market volatility | Non-performing loans | Regulatory Capital | Bank Z-Score | $Fin_{Index}$ |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $\text{Uncertainty}_{\text{Source}}$ | 0.358 | 0.143 | -0.158 | 0.240* | -0.741*** |
| | (0.509) | (0.180) | (0.571) | (0.123) | (0.215) |
| $\text{Uncertainty}_{\text{Host}}$ | -0.506** | -0.883*** | -0.829 | 0.0665 | -0.263 |
| | (0.221) | (0.211) | (0.533) | (0.154) | (0.296) |
| ln $\text{GDP}_{\text{Source}}$ | 0.220 | 0.0893 | 0.199 | 0.190 | -0.0786 |
| | (0.175) | (0.206) | (0.192) | (0.193) | (0.219) |
| ln $\text{GDP}_{\text{Host}}$ | -0.310 | -0.215 | -0.280 | -0.288 | 0.00621 |
| | (0.199) | (0.256) | (0.220) | (0.216) | (0.285) |
| ln Distance | -0.651*** | -0.612*** | -0.610*** | -0.643*** | -0.526*** |
| | (0.107) | (0.138) | (0.103) | (0.105) | (0.152) |
| Common Border | -0.106 | -0.0440 | -0.0616 | -0.129 | -0.0193 |
| | (0.290) | (0.291) | (0.285) | (0.284) | (0.290) |
| Common Language | 0.656*** | 1.029*** | 0.685*** | 0.685*** | 0.872*** |
| | (0.209) | (0.233) | (0.201) | (0.198) | (0.238) |
| Common Currency | -0.630 | -1.019 | -0.583 | -0.641 | -0.843 |
| | (0.508) | (0.791) | (0.482) | (0.473) | (1.082) |
| ln Trade | 0.0510 | -0.0437 | 0.0526 | 0.0629 | 0.000153 |
| | (0.0626) | (0.0717) | (0.0618) | (0.0638) | (0.0804) |
| ln Infrastructure | 0.526** | -0.0141 | 0.637*** | 0.568*** | 1.029 |
| | (0.244) | (0.621) | (0.231) | (0.213) | (1.039) |
| ln Tax | -0.738 | -0.213 | -0.928* | -0.839* | 0.745 |
| | (0.528) | (1.571) | (0.527) | (0.439) | (2.346) |
| ln Population | -0.00480 | 0.505 | -0.0692 | 0.0636 | 0.240 |
| | (0.482) | (0.747) | (0.458) | (0.437) | (0.748) |
| Constant | 9.336*** | 13.12*** | 6.771* | 0.828 | 1.409 |
| | (2.852) | (4.899) | (4.104) | (2.511) | (4.112) |
| Observations | 4,247 | 1,575 | 4,758 | 5,515 | 1,224 |
| R-squared | 0.590 | 0.769 | 0.587 | 0.581 | 0.758 |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| Source Country FE | Yes | Yes | Yes | Yes | Yes |
| Host Country FE | Yes | Yes | Yes | Yes | Yes |
| Country-Pair FE | No | No | No | No | No |

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

**Political Uncertainty**

In this section, the results on effect of political uncertainty on bilateral foreign direct investment are presented. This is done through the estimation of equation 4.1 using proxies for uncertainty regarding the political and regulatory environment focusing on aspects such as government stability, corruption, business environment among others. In column (1) of table 4.6, the Political composite index or the overall political risk assessment index from ICRG is used. This has no significant effects on bilateral foreign direct investment for both countries. Column (2) suggests that law and order and government stability in the host country matter for foreign direct investment. Law and order in the host country has a beneficial effect which suggests it provides an enabling environment for foreign direct investment inflows. The uncertainty variable using this proxy is positive and significant at the 10% level. Whereas, the investment profile which captures the risk to investment is relevant for the source country only in column (3).

However, in column (4) uncertainty proxied using government stability suggests that for the host country this may adversely affect foreign investment. Higher uncertainty concerning government stability reduces foreign direct investment inflows and this negative effect is statistically significant at the 1% level. This corroborates with Brunetti and Weder (2007) who view the concept of institutional uncertainty as covering different types of uncertainties generated by the political environment in a country namely; government stability, political violence, policy uncertainty and enforcement uncertainty. They suggest that government instability or significant changes to government brings in uncertainty concerning the institutional framework in a country. The estimation result for the host country in column (4) confirms the adverse effect of government instability on the regulatory and business environment in the host country. Column (5) corruption is used to assess the effects on foreign direct investment and shows that there are no significant effects in both estimation coefficients. In column (6) a political uncertainty index for the origin and destination country is used. This is derived as are indices from principal component analysis of the following risk components of the ICRG political risk index: law and order, investment profile, government stability and corruption. The estimates for the indices are insignificant.

Table 4.6: Bilateral foreign direct investment and political uncertainty

| | Composite | Law & order | Investment profile | Government Stability | Corruption | Political Uncertainty Index |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\text{Uncertainty}_{\text{Source}}$ | 0.713 | -0.837 | 1.703*** | 0.0168 | 0.230 | -0.142 |
| | (0.706) | (0.646) | (0.362) | (0.265) | (0.402) | (0.104) |
| $\text{Uncertainty}_{\text{Host}}$ | 1.013 | 0.696* | 0.265 | -0.721*** | 0.124 | 0.0505 |
| | (1.093) | (0.360) | (0.298) | (0.271) | (0.337) | (0.155) |
| ln $\text{GDP}_{\text{Source}}$ | 0.170 | 0.175 | 0.194* | 0.167 | 0.181* | 0.168 |
| | (0.118) | (0.113) | (0.115) | (0.117) | (0.108) | (0.114) |
| ln $\text{GDP}_{\text{Host}}$ | -0.0761 | -0.0819 | -0.0810 | -0.0771 | -0.0813 | -0.0725 |
| | (0.0965) | (0.0928) | (0.0985) | (0.0986) | (0.0908) | (0.0949) |
| ln Distance | -0.506*** | -0.485*** | -0.490*** | -0.492*** | -0.487*** | -0.489*** |
| | (0.0850) | (0.0845) | (0.0819) | (0.0862) | (0.0846) | (0.0841) |
| Common Border | -0.00348 | -0.0402 | -0.0243 | -0.0419 | -0.0406 | -0.0420 |
| | (0.237) | (0.234) | (0.230) | (0.240) | (0.235) | (0.233) |
| Common Language | 0.677*** | 0.698*** | 0.683*** | 0.678*** | 0.685*** | 0.693*** |
| | (0.146) | (0.146) | (0.142) | (0.147) | (0.146) | (0.144) |
| Common Currency | -0.977*** | -0.960*** | -1.003*** | -0.959*** | -0.969*** | -0.972*** |
| | (0.345) | (0.349) | (0.342) | (0.340) | (0.349) | (0.348) |
| ln Trade | 0.146*** | 0.158*** | 0.152*** | 0.158*** | 0.158*** | 0.156*** |
| | (0.0494) | (0.0497) | (0.0480) | (0.0499) | (0.0508) | (0.0511) |
| ln Infrastructure | 0.329** | 0.417*** | 0.416*** | 0.414*** | 0.397*** | 0.390*** |
| | (0.142) | (0.156) | (0.158) | (0.141) | (0.148) | (0.151) |
| ln Tax | -1.479*** | -1.349*** | -1.617*** | -1.600*** | -1.552*** | -1.504*** |
| | (0.549) | (0.443) | (0.532) | (0.499) | (0.535) | (0.485) |
| ln Population | -0.799 | -0.799 | -1.001* | -0.755 | -0.835 | -0.804 |
| | (0.528) | (0.528) | (0.534) | (0.526) | (0.532) | (0.530) |
| Constant | -7.762 | 1.823 | -2.102 | 2.949 | -1.745 | -2.965 |
| | (6.217) | (2.051) | (2.288) | (1.904) | (2.326) | (1.971) |
| Observations | 8,605 | 8,687 | 8,687 | 8,687 | 8,671 | 8,671 |
| R-squared | 0.593 | 0.601 | 0.605 | 0.602 | 0.592 | 0.598 |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Source Country FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Host Country FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Country-Pair FE | No | No | No | No | No | No |

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

**Macroeconomic Uncertainty**

In this section estimation results of equation 4.1 using uncertainty regarding the macroeconomic environment measured by inflation and exchange rate variables are presented in table 4.7. In column (1) the results of macroeconomic uncertainty proxied by inflation reveal there is a heterogeneous response to domestic and foreign uncertainty. Higher macroeconomic uncertainty in the source country proxied by inflation has a positive effect on bilateral foreign direct investment. Higher uncertainty in the origin country is associated with greater foreign direct investment outflows. On the other hand, heightened macroeconomic uncertainty in the host country lowers foreign direct investment inflows and this effect is statistically significant at the 1% level. This negative effect is consistent with the robust finding by Solomon and Ruiz (2012) that multinational corporations may not invest in countries with high inflation as it generates more uncertainty about the net present value of long-term investment.

When the exchange rate uncertainty measure is used in in column (2), positive coefficients are observed for both domestic and foreign uncertainty. Domestic investors (multinational corporations) reduce exposure to locally and increase investment abroad when uncertainty at home is heightened. This positive effect is significant at the 5% level and lends support to the proposition that macroeconomic uncertainty should bolster foreign direct investment through the production flexibility hypothesis. This suggests that exchange rate uncertainty in source country boosts foreign direct investment outflows. A larger positive response of foreign direct investment flows to foreign uncertainty is observed at the 10% significance level. This is inconsistent with the proposition that multinational corporations will withhold investment owing to heightened volatility in the exchange rate. An increase in foreign direct investment flows in response to heightened macroeconomic uncertainty is consistent with the findings of

The positive relationship may arise if the objective of foreign direct investment is diversification of location of production to enhance market share and achieve production flexibility (Solomon and Ruiz, 2012). In column (3) a macroeconomic index for the source and host country from a principal component analysis of the price and exchange rate variables is used. A similar pattern to the results in column (2) emerges for domestic and foreign uncertainty. The coefficients for both source and host country are still positive and significant, supportive of an expansion in bilateral foreign direct investment flows following greater uncertainty.

Table 4.7: Bilateral foreign direct investment and macroeconomic uncertainty

| | Inflation | Exchange rate | Macroeconomic Uncertainty Inc |
|---|---|---|---|
| | (1) | (2) | (3) |
| $\text{Uncertainty}_{\text{Source}}$ | 1.992*** | 0.901** | 0.345** |
| | (0.632) | (0.357) | (0.116) |
| Uncertainty $_{\text{Hot}}$ | -0.494*** | 1.138* | 0.191* |
| | (0.142) | (0.625) | (0.110) |
| ln $\text{GDP}_{\text{Source}}$ | -0.172 | -0.150 | -0.176 |
| | (0.113) | (0.123) | (0.117) |
| ln $\text{GDP}_{\text{Host}}$ | 0.207 | 0.170 | 0.209 |
| | (0.163) | (0.176) | (0.167) |
| ln Distance | -0.435*** | -0.428*** | -0.434*** |
| | (0.0947) | (0.0932) | (0.0935) |
| Common Border | 0.138 | 0.158 | 0.154 |
| | (0.240) | (0.238) | (0.238) |
| Common Language | 0.687*** | 0.669*** | 0.689*** |
| | (0.161) | (0.161) | (0.161) |
| Common Currency | -0.754* | -0.689 | -0.746* |
| | (0.435) | (0.449) | (0.440) |
| ln Trade | 0.135*** | 0.145*** | 0.131*** |
| | (0.0496) | (0.0528) | (0.0502) |
| ln Infrastructure | 0.557** | 0.396 | 0.356 |
| | (0.238) | (0.250) | (0.229) |
| ln Tax | -1.122* | -1.166 | -1.028* |
| | (0.615) | (0.721) | (0.602) |
| ln Population | -0.291 | -0.257 | -0.247 |
| | (0.749) | (0.776) | (0.759) |
| Constant | -9.670*** | -9.148 | -6.835 |
| | (3.025) | (6.646) | (4.879) |
| Observations | 5,916 | 5,863 | 5,844 |
| R-squared | 0.553 | 0.544 | 0.552 |
| Time FE | Yes | Yes | Yes |
| Source Country FE | Yes | Yes | Yes |
| Host Country FE | Yes | Yes | Yes |
| Country-Pair FE | No | No | No |

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

**Economic Policy Uncertainty**

This section presents the estimation results of equation 4.1 using the economic policy uncertainty (EPU) index of Baker et al. (2016) to measure uncertainty regarding economic policy. The economic policy uncertainty index captures uncertainty concerning "who will make economic policy decisions, what economic policy actions will be undertaken and when they will be enacted, the economic effects of past , present and future policy actions, and uncertainty induced by policy inaction." (pp1598) [9]

In table 4.8 the sample coverage is reduced as the database is focused on advanced economies (AEs) and a few emerging market economies (EMEs). The countries in the reduced sample used include Australia, Brazil, Canada, Chile, China, Colombia France, Germany, India, Italy, Mexico, Japan, Korea, Netherlands, Russia, Spain, Sweden, the United Kingdom, and the United States. Therefore, the sample excludes financial centres including Hong Kong, Ireland and Singapore for which economic policy uncertainty data is available. Unlike Choi and Furceri (2019) observations in the dependent variable with negative values are not dropped and instead the estimation is carried out using the Poisson estimator.

The estimation results in table 4.8 suggest that bilateral foreign direct investment flows are negatively correlated with economic policy uncertainty in both the origin and destination country. This suggests that multinational corporations in source country $i$ lower investment to a foreign country when it becomes more risky. Alternatively, with heightened uncertainty at home, multinational corporations increase investment at home or lower outflows in bad times. This is consistent with recent empirical findings by Wang (2018) who finds a negative response to uncertainty in both the source and host country using bilateral cross-border bank flows data. Wang (2018) concludes that inflows to the foreign country reduces with greater uncertainty and outflows from the home country of investors retrench in response to heightened domestic uncertainty. This links to prior literature which asserts the pro-cyclical pattern in the movement of capital inflows and outflows (Broner et al., 2013; Davis, 2015). An increase in policy uncertainty lowers foreign direct investment inflows. The negative significant effect of economic policy uncertainty is larger for the host country than the source country effect.

[9]The economic policy uncertainty (EPU) index of Baker et al. (2016) is obtained from: www.policyuncertainty.com

Table 4.8: Bilateral foreign direct investment and economic policy uncertainty

| | Economic Policy Uncertainty |
|---|---|
| $\text{Uncertainty}_{\text{Source}}$ | -0.529* |
| | (0.297) |
| $\text{Uncertainty}_{\text{Host}}$ | -0.845*** |
| | (0.301) |
| ln GDP_Source | 0.412 |
| | (0.285) |
| ln GDP_Host | -0.633* |
| | (0.365) |
| ln Distance | -0.492*** |
| | (0.190) |
| Common Border | -0.126 |
| | (0.386) |
| Common Language | 1.456*** |
| | (0.267) |
| Common Currency | -0.410 |
| | (1.074) |
| ln Trade | 0.0558 |
| | (0.100) |
| ln Infrastructure | 0.639* |
| | (0.347) |
| ln Tax | -0.0490 |
| | (0.986) |
| ln Population | 1.477 |
| | (1.055) |
| Constant | 10.69* |
| | (5.917) |
| Observations | 864 |
| R-squared | 0.579 |
| Time FE | Yes |
| Source Country FE | Yes |
| Host Country FE | Yes |
| Country-Pair FE | No |

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

### 4.5.2 Robustness

If uncertainty in the source country prompts multinational corporations to reduce outward foreign direct investment when domestic uncertainty heightens, it can be anticipated that this effect will be stronger for firms considering foreign direct investment into countries perceived as risky. Specifically, the comparative attractiveness of cross-border investment owing to uncertainty may vary as multinational corporations may be circumspect to invest in a risky host country. To test this conjecture, equation (4.1) is estimated on a sub-sample of two groups based on the income level of the destination countries. The countries are split into advanced and emerging market economies using the IMF definition. Table 4.9 presents the result of estimation of equation (4.1) for the advanced and emerging market destination countries respectively. This is done for the four different aspects of uncertainty.

Column (1) and column (2) in Table 4.9 display the results for economic policy uncertainty for advanced and emerging market economies respectively. The sign for the uncertainty coefficient for uncertainty in column (1) remains negative for source and host country however the coefficient for domestic policy uncertainty changes and is no longer significant from table 4.8. This finding implies that, for advanced economies, cross-border direct investment reduces in response to greater economic policy uncertainty in the recipient country. On the other hand, economic policy uncertainty in the source country of the multinational corporation is irrelevant. Interestingly, for emerging market recipient countries in column(2), the negative response to economic policy uncertainty found in table 4.8 only exists for the source country uncertainty. When multinational corporations are faced with greater domestic uncertainty, they reduce outward foreign direct investment to emerging market economies.

Column (3) and column (4) of table 4.9 present the estimation results for macroeconomic uncertainty proxied by inflation. The response of for uncertainty regarding the macro economy in both source and host country maintains the signs similar to those found in Table 4.7. The positive sign of the uncertainty coefficient for the source country implies that multinational corporations increase outward cross-border investment and counters the proposition that inflows and outflows are pro-cyclical (Davis, 2015) and therefore investment will likely be more biased towards the home country when conditions become unfavourable domestically. Contrastingly, in column(4) there are no significant impacts on the estimates for emerging market recipient countries.

Column(4) and column(5) in Table 4.9 show the results for uncertainty regarding financial markets measured as stock market volatility for advanced and emerging market economies respectively. Similar to Table 4.5, the estimated coefficients suggest a

negative response of bilateral foreign direct investment flows to higher financial uncertainty. However, the coefficients are no longer statistically significant except when the host country is an advanced economy. This finding suggests that higher uncertainty in the host country reduces bilateral foreign direct investment inflows.

Column(7) and column(8) in Table 4.9 show the results for uncertainty regarding the political environment measured using the government stability variable from the international country risk guide (ICRG) index. The results are split for advanced and emerging market economies respectively. The estimated coefficients switch signs from initial results presented in Table 4.6. The estimated coefficients suggest a negative response of bilateral foreign direct investment flows in response to higher political uncertainty. However, this effect is statistically significant for recipient countries that are advanced economies. This suggests that higher political uncertainty owing to government uncertainty will deter foreign direct investment flows to advanced economies. On the other hand, no significant effects are found for emerging market recipient countries.

Overall, for advanced recipient countries, economic policy uncertainty, macroeconomic uncertainty, financial uncertainty and political uncertainty in the local economy curtails cross-border foreign direct investment flows into the economy. On the other hand, for emerging market recipient countries, economic policy uncertainty in the source country reduces foreign direct investment flows coming into the economy. This finding suggests that multinational corporations' decisions to invest in emerging market recipient countries are largely independent of certain types of uncertainty and may be driven by other factors. Alternatively, this may suggest that uncertainty may not be a major determinant for foreign direct investment flows owing to the greater relevance of host country factors (e.g. geographical location, natural resource endowments, institutional environment) as important drivers of foreign direct investment flows. In this scenario, it is anticipated that uncertainty will have an insignificant effect on foreign direct investment flows. This finding corroborates with Cai et al. (2018) who finds that investors more risky or lower rated countries were recipients of greater foreign direct investment flows suggestive of investors inclination to high-risk investment environment.

Table 4.9: Bilateral foreign direct investment and uncertainty

| | Policy | | Macroeconomic | | Financial | | Political | |
|---|---|---|---|---|---|---|---|---|
| | Advanced Economies | Emerging market | Advanced Economies | Emerging market | Advanced Economies | Emerging market | Advanced Economies | Emerging market |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| $\text{Uncertainty}_{\text{Source}}$ | -0.459 | -0.625*** | 2.125*** | 0.709 | -0.350 | -0.454 | -0.0171 | 0.197 |
| | (0.310) | (0.174) | (0.697) | (1.047) | (0.342) | (0.386) | (0.281) | (0.393) |
| $\text{Uncertainty}_{\text{Host}}$ | -0.823** | 0.107 | -0.643** | 0.0282 | -0.664* | -0.523 | -0.863*** | 0.0727 |
| | (0.356) | (0.264) | (0.290) | (0.183) | (0.385) | (0.495) | (0.329) | (0.301) |
| ln $\text{GDP}_{\text{Source}}$ | 0.378 | -0.684** | -0.155 | -0.0616 | -0.0363 | 0.00561 | 0.186 | 0.116 |
| | (0.343) | (0.326) | (0.115) | (0.178) | (0.157) | (0.116) | (0.132) | (0.118) |
| ln $\text{GDP}_{\text{Host}}$ | -0.761** | 0.0400 | 0.228 | -0.160 | 0.0486 | 0.0991 | -0.0590 | -0.128 |
| | (0.383) | (0.553) | (0.166) | (0.148) | (0.191) | (0.143) | (0.116) | (0.147) |
| ln Distance | -0.474** | -3.922*** | -0.457*** | -2.108*** | -0.640*** | -0.967*** | -0.468*** | -1.121*** |
| | (0.195) | (1.274) | (0.104) | (0.175) | (0.112) | (0.169) | (0.1000) | (0.150) |
| Common Border | -0.0289 | | 0.252 | -0.472** | -0.0447 | 1.286** | 0.131 | 0.000930 |
| | (0.391) | | (0.251) | (0.206) | (0.302) | (0.519) | (0.248) | (0.331) |
| Common Language | 1.378*** | 0.804** | 0.518*** | 1.304*** | 0.470** | 1.199*** | 0.479*** | 1.246*** |
| | (0.344) | (0.404) | (0.170) | (0.404) | (0.200) | (0.256) | (0.165) | (0.228) |
| Common Currency | -0.154 | | -0.722 | -1.533*** | 0.392 | -1.815*** | -1.119** | -0.867** |
| | (0.990) | | (0.459) | (0.259) | (0.343) | (0.605) | (0.500) | (0.386) |
| ln Trade | 0.0159 | 0.0111 | 0.121** | -0.0187 | 0.0853 | 0.0168 | 0.153** | 0.0742 |
| | (0.119) | (0.0888) | (0.0557) | (0.0553) | (0.0688) | (0.0604) | (0.0607) | (0.0527) |
| ln Infrastructure | 1.886 | 0.177 | 1.070** | -0.180 | 1.165 | 0.673*** | 0.957 | 0.462*** |
| | (1.755) | (0.426) | (0.536) | (0.274) | (1.473) | (0.201) | (0.646) | (0.159) |
| ln Tax | -0.394 | 0.560 | -0.959 | 0.128 | -0.220 | -0.632** | -1.506** | -1.273*** |
| | (0.990) | (0.689) | (0.665) | (0.321) | (0.776) | (0.284) | (0.629) | (0.281) |
| ln Population | 3.213* | 1.913 | 0.652 | 0.921 | 0.0395 | -0.895 | -1.184 | -0.166 |
| | (1.810) | (1.635) | (1.083) | (0.584) | (1.154) | (0.608) | (0.853) | (0.556) |
| Constant | 7.783 | 56.75*** | -8.457 | 10.43** | 8.732 | 0.712 | -14.02** | 1.405 |
| | (10.07) | (12.24) | (5.505) | (4.454) | (8.434) | (3.644) | (5.683) | (4.065) |
| Observations | 601 | 263 | 3,968 | 1,700 | 2,632 | 2,136 | 4,325 | 3,718 |
| R-squared | 0.576 | 0.847 | 0.550 | 0.773 | 0.575 | 0.645 | 0.601 | 0.600 |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Source Country FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Host Country FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Country-Pair FE | No | No | No | No | No | No | No | No |

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

## 4.6 Conclusion

This chapter contributes to the literature linking uncertainty and cross-border capital flows. Following the global financial crisis, the role of uncertainty for macroeconomic outcomes has increased in prominence. Distinct from previous studies focusing on uncertainty as a global supply factor of financial flows, this chapter uses the bilateral structure of the foreign direct investment flow data from the OECD database to control for both source and host country effects and thereby to assess the role of different types of country-specific uncertainty as a push and pull factor for cross-border foreign direct investment flows.

The results suggest that the different forms of uncertainty do not move in the same direction. The response of foreign direct investment flows depends on the type of uncertainty. Heightened uncertainty and risk regarding financial markets in the recipient country, measured by country-specific stock market volatility, reduces foreign direct investment inflows into the economy. This effect occurs only for foreign direct investment towards advanced economies and not emerging market economies as recipient countries.

Furthermore, this finding of the relevance for the host country conditions in attracting foreign direct investment inflows is further confirmed when uncertainty regarding the political and regulatory environment, measured by government stability is considered. Higher uncertainty measured by country-specific government stability in an economy reduces cross-border direct investment flows into this economy. Multinational corporation's lower foreign direct investment inflows in response to heightened political uncertainty in the host country.

Whereas higher country specific macroeconomic uncertainty in the source country encourages foreign direct investment outflows. These effects are significant for advanced economies and not emerging market economies.

Furthermore, multinational corporations' lower outflows in response to heightened economic policy uncertainty both in the source and host country. Higher economic policy uncertainty in the source country discourages multinational corporations from engaging in risky investment abroad resulting in lower outflows. Furthermore, advanced economies with higher policy uncertainty attract less foreign direct investment. In addition, greater economic policy uncertainty in the source country of the multinational firm, makes it less attractive for cross-border direct investment going to emerging market recipients. Economic policy uncertainty matters more for foreign direct investment to emerging market recipients. Therefore, advanced economies with greater uncertainty

regarding financial, political, macroeconomic and economic policy attract less foreign direct investment flows. On the other hand, multinational corporations invest less in emerging market host countries with high economic policy uncertainty. The other aspects of uncertainty matter less for emerging market recipient countries. These findings suggest that foreign direct investment flows to emerging market recipient countries are broadly independent of certain types of uncertainty and could be driven by other factors.

# 4.A Appendix

## 4.A.1 Additional analytical results

Table 4.10 suggests the evidence on foreign direct investment flows responds to uncertainty in the domestic and foreign country in an asymmetric manner. Only the period after 2008 in column (2) confirms the negative effects of source and host uncertainty proxied by country-specific stock market volatility.

p.191

Table 4.10: Bilateral foreign direct investment, financial uncertainty-robustness

| | (1) Pre-Crisis | (2) Post-Crisis | (3) Country-pair |
|---|---|---|---|
| Stock $vol_{Source}$ | -0.187 | -1.353* | -0.376 |
| | (0.368) | (0.807) | (0.335) |
| Stock $vol_{Host}$ | -0.596* | -2.292*** | -0.581** |
| | (0.334) | (0.574) | (0.266) |
| ln $GDP_{Source}$ | -0.216 | 0.131 | -0.0607 |
| | (0.289) | (0.160) | (0.131) |
| ln $GDP_{Host}$ | 0.256 | -0.117 | 0.0430 |
| | (0.359) | (0.207) | (0.159) |
| ln Distance | -0.597*** | -0.603*** | |
| | (0.128) | (0.116) | |
| Common Border | -0.342 | 0.0512 | |
| | (0.276) | (0.339) | |
| Common Language | 0.889*** | 0.487* | |
| | (0.172) | (0.276) | |
| Common Currency | -0.0417 | -1.102 | 0.336 |
| | (0.437) | (0.972) | (0.399) |
| ln Trade | 0.198** | -0.0505 | 0.0484 |
| | (0.0783) | (0.0632) | (0.0857) |
| ln Infrastructure | 0.979*** | -0.666 | 0.707*** |
| | (0.347) | (0.762) | (0.209) |
| ln Tax | -1.354* | -1.068 | -0.262 |
| | (0.708) | (1.042) | (0.591) |
| ln Population | -0.0522 | -0.314 | -0.191 |
| | (1.020) | (0.568) | (0.633) |
| Constant | -8.022** | 20.68*** | |
| | (4.087) | (5.939) | |
| Observations | 2,573 | 2,220 | 4,179 |
| R-squared | 0.587 | 0.679 | |
| Time FE | Yes | Yes | Yes |
| Source Country FE | Yes | Yes | No |
| Host Country FE | Yes | Yes | No |
| Country-Pair FE | No | No | Yes |
| Number of pair-id | | | 593 |

Robust standard errors in parentheses

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

Table 4.11: Bilateral foreign direct investment and economic uncertainty 2001-2012

| | (1) FDI | (2) FDI | (3) FDI |
|---|---|---|---|
| Uncertainty_Source | -0.936*** | -0.192** | -0.219*** |
| | (0.130) | (0.0749) | (0.0724) |
| Uncertainty_Host | 0.570*** | 0.0822 | 0.108** |
| | (0.142) | (0.0583) | (0.0528) |
| Constant | 8.245*** | 5.992*** | |
| | (0.666) | (0.732) | |
| Observations | 10,047 | 10,028 | 9,642 |
| R-squared | 0.022 | 0.665 | |
| Time FE | Yes | Yes | Yes |
| Source Country FE | No | Yes | No |
| Host Country FE | No | Yes | No |
| Country-Pair FE | No | No | Yes |
| Number of pair-id | | | 1,045 |

Heteroskedasticity robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Dependent variable is bilateral FDI in levels from source country $i$ to host country $j$ in year $t$. Uncertainty Source and Uncertainty Host are the one period lagged stock market volatility in source country and host country in log levels. All regressions are carried out using Poisson. foreign direct investment data from UNCTAD for the period 2001-2012.

Table 4.12: Bilateral foreign direct investment, uncertainty and information asymmetry

| | (1) FDI | (2) FDI | (3) FDI | (4) FDI |
|---|---|---|---|---|
| Uncertainty_Source | -0.436*** | -0.432*** | -0.423*** | -0.438*** |
| | (0.106) | (0.105) | (0.106) | (0.107) |
| Uncertainty_Host | -0.263 | 0.0903 | 0.174** | -0.00662 |
| | (0.586) | (0.0799) | (0.0798) | (0.134) |
| ln Distance | -0.988*** | -0.822*** | -0.826*** | -0.831*** |
| | (0.250) | (0.0839) | (0.0845) | (0.0852) |
| Contiguity | 0.264 | 0.263 | 0.262 | 0.262 |
| | (0.163) | (0.161) | (0.163) | (0.163) |
| Common Language | 1.071*** | -0.689 | 1.067*** | 1.116*** |
| | (0.210) | (0.691) | (0.210) | (0.215) |
| Common Currency | 1.422*** | 1.498*** | 2.509*** | 1.464*** |
| | (0.332) | (0.325) | (0.915) | (0.350) |
| Corporate Tax_Host | -0.731*** | -0.771*** | -0.737*** | |
| | (0.186) | (0.193) | (0.189) | |
| ln GDP_Source | 0.0802* | 0.0770* | 0.0805* | 0.0853** |
| | (0.0427) | (0.0425) | (0.0426) | (0.0435) |
| ln GDP_Host | -0.0525 | -0.0496 | -0.0536 | -0.0632 |
| | (0.0400) | (0.0399) | (0.0397) | (0.0404) |
| Distance*Uncertainty_Host | 0.0502 | | | |
| | (0.0686) | | | |
| Common Language*Uncertainty_Host | | 0.560** | | |
| | | (0.225) | | |
| Common Currency*Uncertainty_Host | | | -0.369 | |
| | | | (0.319) | |
| Population_Host | | | | -0.286** |
| | | | | (0.116) |
| Population_Host*Uncertainty_Host | | | | 0.0775** |
| | | | | (0.0347) |
| Constant | 8.521*** | 7.187*** | 7.285*** | 9.585*** |
| | (1.926) | (1.019) | (1.034) | (1.111) |
| Observations | 5,777 | 5,777 | 5,777 | 5,694 |
| R-squared | 0.820 | 0.821 | 0.819 | 0.818 |
| Time FE | Yes | Yes | Yes | Yes |
| Source Country FE | Yes | Yes | Yes | Yes |
| Host Country FE | Yes | Yes | Yes | Yes |
| Country-Pair FE | No | No | No | No |

Heteroskedasticity robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Dependent variable is bilateral FDI in levels from source country $i$ to host country $j$ in year $t$. Uncertainty Source and Uncertainty Host are the one period lagged stock market volatility in source country and host country in log levels. All regressions are carried out using Poisson pseudo maximum likelihood (PPML). Bilateral FDI data from advanced economies to emerging market and developing host countries from UNCTAD for period 2001-2012.

Table 4.13: Bilateral foreign direct investment, uncertainty and institutional risk

| | (1) FDI | (2) FDI | (3) FDI | (4) FDI | (5) FDI | (6) FDI |
|---|---|---|---|---|---|---|
| Uncertainty_Source | -0.431*** | -0.422*** | -0.415*** | -0.418*** | -0.427*** | -0.422*** |
| | (0.107) | (0.103) | (0.102) | (0.101) | (0.106) | (0.105) |
| Uncertainty_Host | 0.164** | 0.169** | 0.163** | 0.161** | 0.141 | 0.161** |
| | (0.0809) | (0.0738) | (0.0820) | (0.0801) | (0.0874) | (0.0805) |
| ln Distance | -0.827*** | -0.829*** | -0.826*** | -0.829*** | -0.826*** | -0.826*** |
| | (0.0845) | (0.0846) | (0.0845) | (0.0845) | (0.0845) | (0.0844) |
| Contiguity | 0.259 | 0.262 | 0.260 | 0.261 | 0.267 | 0.265 |
| | (0.163) | (0.163) | (0.163) | (0.163) | (0.163) | (0.163) |
| Common Language | 1.066*** | 1.074*** | 1.068*** | 1.069*** | 1.068*** | 1.070*** |
| | (0.209) | (0.210) | (0.209) | (0.209) | (0.210) | (0.210) |
| Common Currency | 1.427*** | 1.424*** | 1.422*** | 1.425*** | 1.425*** | 1.424*** |
| | (0.331) | (0.332) | (0.331) | (0.332) | (0.332) | (0.332) |
| Corporate Tax_Host | -0.713*** | -0.620*** | -0.708*** | -0.739*** | -0.728*** | -0.713*** |
| | (0.190) | (0.188) | (0.183) | (0.182) | (0.191) | (0.187) |
| ln GDP_Source | 0.0821* | 0.0861** | 0.0830** | 0.0824* | 0.0839** | 0.0792* |
| | (0.0428) | (0.0415) | (0.0422) | (0.0434) | (0.0427) | (0.0427) |
| ln GDP_Host | -0.0553 | -0.0593 | -0.0554 | -0.0548 | -0.0578 | -0.0515 |
| | (0.0397) | (0.0386) | (0.0392) | (0.0405) | (0.0397) | (0.0396) |
| Govt Effectiveness_Host | 0.137 | | | | | |
| | (0.411) | | | | | |
| Govt Effectiveness_Host*Uncertainty_Host | 0.00973 | | | | | |
| | (0.114) | | | | | |
| Regulatory Quality_Host | | 0.692** | | | | |
| | | (0.315) | | | | |
| Regulatory Quality_Host*Uncertainty_Host | | -0.0781 | | | | |
| | | (0.0809) | | | | |
| Control of Corruption_Host | | | 0.590 | | | |
| | | | (0.363) | | | |
| Control of Corruption_Host*Uncertainty_Host | | | -0.0454 | | | |
| | | | (0.0906) | | | |
| Rule of Law_Host | | | | 0.513* | | |
| | | | | (0.310) | | |
| Rule of Law_Host*Uncertainty_Host | | | | -0.00613 | | |
| | | | | (0.0785) | | |
| Political Stability_Host | | | | | 0.308 | |
| | | | | | (0.269) | |
| Political Stability_Host*Uncertainty_Host | | | | | -0.0807 | |
| | | | | | (0.0799) | |
| Voice and Accountability_Host | | | | | | 0.297 |
| | | | | | | (0.240) |
| Voice and Accountability_Host*Uncertainty_Host | | | | | | -0.0437 |
| | | | | | | (0.0565) |
| Constant | 7.420*** | 6.694*** | 7.514*** | 7.321*** | 7.434*** | 7.270*** |
| | (1.062) | (0.962) | (1.058) | (1.049) | (1.048) | (1.014) |
| Observations | 5,777 | 5,777 | 5,777 | 5,777 | 5,777 | 5,777 |
| R-squared | 0.819 | 0.821 | 0.823 | 0.824 | 0.819 | 0.819 |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Source Country FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Host Country FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Country-Pair FE | No | No | No | No | No | No |

Heteroskedasticity robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Dependent variable is bilateral FDI in levels from source country $i$ to host country $j$ in year $t$. Uncertainty Source and Uncertainty Host are the one period lagged stock market volatility in source country and host country in log levels. All regressions are carried out using Poisson pseudo maximum likelihood (PPML). Institutional risk and political environment indicators taken from World Governance Indicators(WGI).

# Chapter 5

# Conclusion

The outcome of the global financial crisis and its implications for financial stability have highlighted the influence of investor sentiment or risk aversion for the movement of cross-border financial flows. The behaviour of cross-border investors in the context of shifting external financial conditions has significance for policy makers concerned about financial stability. Consequently, risks for multinational corporations' foreign direct investment activities arising from contextual factor such as political, regulatory, and financial environment have been considered in the literature, the latter having less evidence (Kellard et al., 2018).

The analysis of this thesis is motivated by the enhanced financial integration across countries and the evolution of external financial conditions in the aftermath of the global financial crisis including the monetary policy response by the major advanced economies. Chapter 2 examines the degree to which financial development in source and host countries influence the foreign direct investment activities of multinational corporations. Results from chapter 2 indicate that the development of financial markets has a positive impact on cross-border direct investment. This corroborates with the advantageous effects found for both source and host country financial development in prior empirical studies by Desbordes and Wei (2017) and Donaubauer et al. (2016). Furthermore, the global financial crisis exerted an adverse effect on bilateral foreign direct investment. Similarly, considering the idiosyncratic financial constraints in the form of a local systemic banking crisis in the home country resulted in multinational corporation reducing the magnitude of outward foreign direct investment. This suggests that multinational corporation were financially constrained during a local systemic banking crisis which in turns limits the availability of external finance for investment at home. On the other hand, financial conditions in the host country following a domestic systemic banking crisis are found to increase bilateral foreign direct investment. The main

policy implications of chapter 2 relates to the both source and host countries. Countries seeking to enable the entry and growth of multinational corporations should execute policies that will enhance financial development. Secondly, these countries ought to put in place policies to sustain access to external financing for firms in periods of severe financial distress. Furthermore, better developed financial system are important as they will safeguard the access to external financing by local firms as domestic borrowing by multinational corporations expands (Desbordes and Wei, 2017). Therefore, chapter 2 of this thesis shows evidence that having a well-developed financial system will be advantageous for both domestic and external investors.

Chapter 3 examines how unconventional monetary policy implemented by central banks in major advanced economies affected the assets allocation choices of global institutional investors across countries. The impact of the unconventional monetary policies of advanced economies on the geographic portfolio allocation choices is identified using data on large private institutional investors from 1999Q4 to 2016Q4. The analysis focuses on two asset categories, equities and bonds. The empirical analysis finds that the monetary policy actions of central banks in advanced economies had significant effects on institutional investor's portfolio allocations. Furthermore, consistent with the risk-taking channel of monetary policy, the results suggest that the international transmission effects of monetary policy induced institutional investors to rebalance towards emerging markets and developing economies. Although the magnitude and economic significance is small, this is divergent from prior evidence, a significant effect for the role of institutional investors in the large magnitude of capital flows going to emerging market and developing economies is found. Therefore, the results found in chapter 3 are divergent from Cenedese and Elard (2018) who find no evidence of the risk-taking channel in the international transmission of monetary policy on portfolio allocation.

Chapter 3 finds that the international transmission effects of monetary policy on portfolio allocation were heterogeneous in the conventional and unconventional monetary policy period. The results show evidence of home bias for U.S. equities in response to domestic monetary policy. Among the different proxies used, the shadow policy rate exerted greater effects on portfolio allocation compared to other proxies of monetary policy used. This result is consistent with the prior evidence which confirms the proposition that large-scale asset purchases proxied by the size of the central bank balance sheet may exclude information content when central bank communication is used as a tool, for example forward guidance (Buch et al., 2018). Additionally, chapter 3 finds evidence suggesting rebalancing of portfolio allocations toward other advanced economies other than the home country conducting monetary policy consistent with Cenedese and Elard (2018). Overall, the contribution of chapter 3 to the literature in the analysis of portfolio weights is that private institutional investors shifted their portfolio weights

to emerging markets and developing economies. Another related implication of this result is that these capital flows could potentially be a source of financial instability for the emerging market and developing economies depending on the type of asset institutional investors reallocate given that some asset classes are by their inherent nature less stable than others. The evidence supports the economically significant link between the monetary policy actions of major economies to the portfolio allocation choices of non-bank financial intermediaries. The monetary policy expansion by systemic economies induced institutional investors to take greater risk and rebalance to other economies. The results in chapter 3 have implications for policy makers. The monetary policy stance of advanced economies' is important for cross-border portfolio allocation decisions of financial intermediaries. The chapter specifically relates to the policy issue addressing the role of institutional investors in the surge in capital flows going to emerging markets and developing economies in response to the expansionary monetary policies implemented central banks of major advanced economies. The findings lend support to the proposition that institutional investors engaged in portfolio allocation choices that led to the surge in capital flows to emerging markets and developing economies in the aftermath of the global financial crisis. There is significant evidence for this hypothesis suggestive of the shift in institutional investors' portfolio allocation toward assets in emerging markets and developing economies. Gaining a better comprehension of how institutional investors respond to monetary policy changes can have considerable implications for the transmission of monetary policy through institutional investors and more broadly the real economy. The central bank may be interested in identifying the unexpected consequences of unconventional monetary policy to better comprehend where risks in the non-bank financial sector could stem from. This finding relates the investment allocation behaviour or choices by institutional investors to cross-border capital inflows received by emerging and developing economies in the post-crisis period. The effects of these policies were varied across the global financial cycle and the monetary policy transmission mechanism channels for the central bank policy actions were distinct. Therefore, capital inflows as a result of policy actions in systemic economies will necessitate vigilance in building up tools to bolster resilience to external shocks by policy makers in emerging and developing economies.

There are several potential avenues for future research from the analysis in chapter 3. Specifically, the role of systemic economies monetary policies and financial instability, in the unconventional monetary policy period. Additionally, following the low interest rate environment and the increased demand for emerging market and developing economies assets, the role of institutional investors in driving capital to these markets can be investigated further. For example, the response of investors to unconventional monetary policy focusing on adjustments in the currency denomination of

assets in their portfolio holdings rather than asset class or volumes only. This chapter is unable to delve deeper into the currency compositions of portfolio holdings owing to data limitations. This could be done to assess whether investors lower the allocation of assets in the domestic country conducting monetary policy and rebalance toward other foreign currencies. This would contribute to the literature on the rebalancing behaviour of institutional investors in response to monetary policies of advanced economies. Focusing on the portfolio investment in sovereign and corporate assets in emerging and developing countries by institutional investors would be beneficial in assessing the potential financial stability risks that may ensue due to balance sheet vulnerabilities to external financial conditions. This could provide insights into both public and corporate sector balance sheet vulnerabilities given the concerns about financial stability and spillover risks with the recent growth in non-financial corporate sector debt of emerging markets and developing economies after the global crisis; which has been largely attributed to the easing global financing conditions induced by monetary policies of advanced economies.

Chapter 4 examines the response of foreign direct investment to domestic and foreign uncertainty. The main findings show that multinational corporations' cross-border direct investment respond heterogeneously to domestic and foreign uncertainty. Moreover, the response of foreign direct investment varies by the type of uncertainty. Additionally, there are differences in the role of country-specific uncertainty depending on whether the host countries are advanced or emerging market and developing economies. Greater uncertainty and risk regarding financial markets, measured by stock market volatility in the host country deters foreign direct investment. The empirical evidence highlights that this negative significant effect of financial uncertainty exists for developed destination countries and not for emerging market and developing economies.

On the other hand, with political uncertainty, host country uncertainty particularly government stability has a negative impact on foreign direct investment flows into the economy. The results suggest that uncertainty related to the political environment leads to multinational corporations to delay direct investment abroad. Interestingly, this effect is present when the recipient countries are advanced economies and absent for emerging market and developing economies. Similarly, higher country specific macroeconomic uncertainty in the domestic economy leads to multinational corporations to retrench or reduce outward direct investment. This result suggests that the volume of outflows by multinational corporations declines in response to heightened uncertainty in the home country. Nevertheless, this negative repercussions of heightened macroeconomic uncertainty in the source country on foreign direct investment is only evident for advanced economies and not developing countries.

Contrastingly, the results with respect to the role of economic policy uncertainty confirm the relevance of both source and host country uncertainty for bilateral foreign direct investment flows. The findings based on economic policy uncertainty provide the insight that greater economic policy uncertainty in the home country deters multinational corporations from investing in foreign markets. For both advanced and emerging market recipient, greater economic policy uncertainty makes them less attractive destinations for multinational corporations' foreign direct investment. On the whole, for advanced economy destination countries, the results in chapter 4 provide some support for the hypothesis that a retrenchment or reduction in capital flows will occur during bad times. The empirical evidence highlights that when there is greater uncertainty at home, multinational corporations respond to greater uncertainty regarding financial, political, macroeconomic and economic policy aspects of the economy by reducing outward foreign direct investment flows going to advanced destination countries. In contrast, among the different types of uncertainty, only economic policy uncertainty provides evidence of a significant response of foreign direct investment flows to emerging markets and developing economies. Higher economic policy uncertainty in the source country deters multinational corporation's foreign direct investment outflows to emerging market host countries.

# Bibliography


Aggarwal, R., C. Kearney, and B. Lucey (2012). Gravity and culture in foreign portfolio investment. *Journal of Banking & Finance 36*(2), 525–538.

Aguiar, M. and G. Gopinath (2005). Fire-Sale Foreign Direct Investment and Liquidity Crises. *The Review of Economics and Statistics 87*(3), 439–452.

Ahmed, A. D. (2013). Effects of financial liberalization on financial market development and economic performance of the SSA region: An empirical assessment. *Economic Modelling 30*, 261–273.

Ahmed, S. and A. Zlate (2014). Capital flows to emerging market economies: A brave new world? *Journal of International Money and Finance 48*, 221–248.

Aleksynska, M. and O. Havrylchyk (2013). FDI from the south: The role of institutional distance and natural resources. *European Journal of Political Economy 29*, 38–53.

Alfaro, L., A. Chanda, S. Kalemli-Ozcan, and S. Sayek (2004). FDI and economic growth: the role of local financial markets. *Journal of International Economics 64*(1), 89–112.

Alfaro, L., A. Chanda, S. Kalemli-Ozcan, and S. Sayek (2010). Does foreign direct investment promote growth? Exploring the role of financial markets on linkages. *Journal of Development Economics 91*(2), 242–256.

Alfaro, L. and J. Chauvin (2016). Foreign Direct Investment, Finance, and Economic Development (September 21, 2016). Chapter for the Encyclopedia of International Economics and Global Trade, Forthcoming.

Alfaro, L., S. Kalemli-Ozcan, and V. Volosovych (2008). Why Doesn't Capital Flow from Rich to Poor Countries? An Empirical Investigation. *Review of Economics and Statistics 90*(2), 347–368.

Ammer, J., S. Claessens, A. Tabova, and C. Wroblewski (2018). Searching for Yield Abroad: Risk-Taking Through Foreign Investment in U.S. Bonds. *BIS Working Paper nO 687* (1224).

Anderson, J. E. (2011). The Gravity Model. *Annual Review of Economics 3*(1), 133–160.

Anderson, J. E. and E. V. A. N. Wincoop (2003). Gravity with Gravitas : A Solution to the Border Puzzle. *The American Economic Review 93*(1), 170–192.

Antras, P., M. a. Desai, and C. Fritz Foley (2009). Multinational firms, FDI flows, and imperfect capital markets. *Quarterly Journal of Economics 124*(3), 1171–1219.

Arbatli, E. (2011). *Economic Policies and FDI Inflows to Emerging Market Economies*. IMF Working Papers. IMF Working Paper WP/11/192, International Monetary Fund. Washington DC.

Asiedu, E. (2002). On the Determinants of Foreign Direct Investment to Developing Countries: Is Africa Different? *World Development 30*(1), 107–119.

Baker, M., C. F. Foley, and J. Wurgler (2009). Multinationals as arbitrageurs: The effect of stock market valuations on foreign direct investment. *Review of Financial Studies 22*(1), 337–369.

Baker, S. R., N. Bloom, and S. J. Davis (2016). Measuring Economic Policy Uncertainty. *The Quarterly Journal of Economics 131*(4), 1593–1636.

Baskaya, Y. S., J. di Giovanni, e. Kalemli-Özcan, J. L. Peydro, and M. F. Ulu (2017). Capital flows and the international credit channel. *Journal of International Economics 108*, S15–S22.

Beck, T., A. Demirgüç-Kunt, and R. Levine (2009). Financial Institutions and Markets across Countries and over Time – Data and Analysis. *World Bank Policy Research Working Paper WPS4943*.

Bénassy-Quéré, A., M. Coupet, and T. Mayer (2007). Institutional determinants of foreign direct investment. *World Economy 30*(5), 764–782.

Bernanke, B. S. (1983). Irreversibility, Uncertainty, and Cyclical Investment. *The Quarterly Journal of Economics 88*(February), 85–106.

Bianco, S. D. and N. C. T. Loan (2017). FDI Inflows, Price and Exchange Rate Volatility: New Empirical Evidence from Latin America. *International Journal of Financial Studies 5*(1), 6.

Bilir, L., D. Chor, and K. Manova (2014). *Host Country Financial Development and Multinational Activity*. NBER Working Paper 20046. National Bureau of Economic Research, Cambridge, MA.

Blonigen, B. and J. Piger (2014). Determinants of foreign direct investment. *Canadian Journal of Economics/Revue 47*(3), 775–812.

Bloom, N. (2009). The Impact of Uncertainty Shocks on the Cross-Section of Returns. *Econometrica 77*(3), 623–685.

Bloom, N. (2014). Fluctuations in Uncertainty. *The Journal of Economic Perspectives 28*(2), 153–176.

Bloom, N. (2017). Observations on Uncertainty. *The Australian Economic Review 50*(1), 79–84.

Boermans, A. M. and R. Vermeulen (2016). International Investment Positions Revisited: Investor Heterogeneity and Individual Security Characteristics. *DNB Working Paper*.

Bonaime, A., H. Gulen, and M. Ion (2018). Does policy uncertainty affect mergers and acquisitions? *Journal of Financial Economics 129*(3), 531–558.

Bonizzi, B. (2017). Institutional investors' allocation to emerging markets: A panel approach to asset demand. *Journal of International Financial Markets, Institutions and Money 47*, 47–64.

Borio, C. and P. Disyatat (2010). Unconventional monetary policies: An appraisal. *Manchester School 78*(6), 53–89.

Borio, C. and A. Zabai (2016). Unconventional monetary policies : a re-appraisal. *BIS Working Paper No 570* (570).

Bowman, D., J. M. Londono, and H. Sapriza (2015). U.S. unconventional monetary policy and transmission to emerging market economies. *Journal of International Money and Finance 55*, 27–59.

Broner, F., T. Didier, A. Erce, and S. L. Schmukler (2013). Gross capital flows: Dynamics and crises. *Journal of Monetary Economics 60*(1), 113–133.

Brunetti, A. and B. Weder (2007). Investment and institutional uncertainty: A comparative study of different uncertainty measures. *Weltwirtschaftliches Archiv 134*(3), 513–533.

Bua, G. and P. G. Dunne (2017). The Portfolio Rebalancing Effects of the ECB's Asset Purchase Programme. *SSRN Electronic Journal*.

Buch, C. M., M. Bussiere, L. Goldberg, and R. Hills (2018). The International Transmission of Monetary Policy. *NBER Working Paper No. 24454, National Bureau of Economic Research Cambridge, Mass., USA*.

Buch, C. M., I. Kesternich, A. Lipponer, and M. Schnitzer (2009). *Financial constraints and the margins of FDI.* Bundesbank Discussion Paper Series 1: Economic Studies No29/2009.

Caballero, R. J. and A. Simsek (2018). A model of fickle capital flows and retrenchment. *NBER Working Paper No. 22751, National Bureau of Economic Research Cambridge, Mass., USA*.

Cai, P., Q. Gan, and S. J. Kim (2018). Do sovereign credit ratings matter for foreign direct investments? *Journal of International Financial Markets, Institutions and Money 55*, 50–64.

Cai, P., S. J. Kim, and E. Wu (2019). Foreign direct investments from emerging markets: The push-pull effects of sovereign credit ratings. *International Review of Financial Analysis 61*(October 2018), 110–125.

Carpenter, S., S. Demiralp, J. Ihrig, and E. Klee (2015). Analyzing Federal Reserve asset purchases: From whom does the Fed buy? *Journal of Banking and Finance 52*, 230–244.

Castelnuovo, E., G. Lim, and G. Pellegrino (2017). A short review of the recent literature on uncertainty. *The Australian Economic Review 50*(1), 79–84.

Cenedese, G. and I. Elard (2018). Unconventional monetary policy and the portfolio choice of international mutual funds. *Bank of England Working Paper No.705(London: Bank of England)* (705).

Cerutti, E., S. Claessens, and L. Ratnovski (2014). Global Liquidity and Drivers of Cross-Border Bank Flows. *IMF Working Paper WP/14/69*.

Chenaf-Nicet, D. and E. Rougier (2016). The effect of macroeconomic instability on FDI flows: A gravity estimation of the impact of regional integration in the case of Euro-Mediterranean agreements. *International Economics 145*, 66–91.

Choi, S. and D. Furceri (2019). Uncertainty and cross-border banking flows. *Journal of International Money and Finance 93*, 260–274.

Choi, S., D. Furceri, Y. Huang, and P. Loungani (2018). Aggregate uncertainty and sectoral productivity growth: The role of credit constraints. *Journal of International Money and Finance 88*, 314–330.

Choi, S. and M. Shim (2019). Financial vs. Policy Uncertainty in Emerging Market Economies. *Open Economies Review 30*(2), 297–318.

Cihak, M., A. Demirgüç-Kunt, E. Feyen, and R. Levine (2012). *Benchmarking financial systems around the world*. Number 6175. World Bank Policy Research Working Papers WPS6175, Washington DC.

Coeurdacier, N., R. a. D. Santis, and A. Aviat (2009). *Cross-Border Mergers and Acquisitions Financial and institutional Forces*. European Central Bank, Working Paper Series NO 1018/March 2009. Frankfurt.

Dabla-Norris, E., J. Honda, A. Lahreche, and G. Verdier (2010). *FDI Flows to Low-Income Countries : Global Drivers and Growth Implications*. IMF Working Paper WP/10/132, Washington DC.

Dailami, M., S. Kurlat, and J. J. Lim (2012). Bilateral M&A activity from the Global South. *The North American Journal of Economics and Finance 23*(3), 345–364.

D'Amico, S. and T. B. King (2013). Flow and stock effects of large-scale treasury purchases: Evidence on the importance of local supply. *Journal of Financial Economics 108*(2), 425–448.

Daude, C. and E. Stein (2007). The quality of institutions and foreign direct investment. *Economics and Politics 19*(3), 317–344.

David, A. C., M. Mlachila, and A. Moheeput (2015). Does international integration matter for financial development in Africa? *Applied Economics 47*(15), 1525–1549.

Davis, J. S. (2015). The Cyclicality of (Bilateral) Capital Inflows and Outflows. *Working Paper 247. Federal Reserve Bank of Dallas, Globalization and Monetary Policy Institute*.

Desai, M., C. Foley, and J. Hines (2004). A multinational perspective on capital structure choice and internal capital markets. *The Journal of Finance*.

Desbordes, R. and S.-J. Wei (2014). *The Effects of Financial Development on Foreign Direct investment*. World Bank Policy Research Working Paper WPS7065 World Bank Washington DC.

Desbordes, R. and S.-J. Wei (2016). Foreign Direct Investment and External Financing Conditions: Evidence from Normal and Crisis Times. *The Scandinavian Journal of Economics* (Accepted Author Manuscript).

Desbordes, R. and S.-J. Wei (2017). The Effects of Financial Development on Foreign Direct investment. *Journal of Development Economics 127*, 153–168.

Di Giovanni, J. (2005). What drives capital flows? The case of cross-border M&A activity and financial deepening. *Journal of International Economics 65*(1), 127–149.

Donaubauer, J., E. Neumayer, and P. Nunnenkamp (2016). Financial market development in host and source countries and its effects on bilateral FDI.

Eichengreen, B. and P. Gupta (2015). Tapering talk: The impact of expectations of reduced Federal Reserve security purchases on emerging markets. *Emerging Markets Review 25*, 1–15.

Feng, Y. (2017). Determinants of Foreign Direct Investment (FDI). *Oxford Research Encyclopedia of Politics* (October), 1–17.

Fernández, A. and C. E. Tamayo (2017). From Institutions to Financial Development and Growth: What Are the Links? *Journal of Economic Surveys 31*(1), 17–57.

Foley, C. F. and K. Manova (2015). International Trade, Multinational Activity, and Corporate Finance. *Annual Review of Economics 7*(1), 119–146.

Forbes, K. J. and F. E. Warnock (2012). Capital flow waves: Surges, stops, flight, and retrenchment. *Journal of International Economics 88*(2), 235–251.

Forssbaeck, J. and L. Oxelheim (2011). Corporate financial determinants of foreign direct investment. *Quarterly Review of Economics and Finance 51*(3), 269–282.

Fratzscher, M. (2012). Capital flows, push versus pull factors and the global financial crisis. *Journal of International Economics 88*(2), 341–356.

Fratzscher, M., M. Lo Duca, and R. Straub (2016). On the international spillovers of US Quantitative Easing. *The Economic Journal*.

Frenkel, M., K. Funke, and G. Stadtmann (2004). A panel analysis of bilateral FDI flows to emerging economies. *Economic Systems 28*(3), 281–300.

Froot, K. A. and J. C. Stein (1991). Exchange Rates and Foreign Direct Investment : An Imperfect Capital Markets Approach. *The Quarterly Journal of Economics 106*(4), 1191–1217.

Gagnon, J., M. Raskin, J. Remache, and B. Sack (2011). The financial market effects of the federal reserve's large-scale asset purchases. *International Journal of Central Banking 7*(1), 3–43.

Gauvin, L., C. McLoughlin, and D. Reinhardt (2014). Policy Uncertainty Spillovers to Emerging Markets Evidence from Capital Flows. *Bank of England Working Paper No.512(London: Bank of England)*.

Gil-Pareja, S., R.-L. Vivero, and J. Paniagua (2013). The effect of the great recession on foreign direct investment: global empirical evidence with a gravity approach. *Applied Economics Letters 20*(13), 1244–1248.

Gourio, F., M. Siemer, and A. Verdelhan (2016). Uncertainty and International Capital Flows. *Working Paper, MIT Sloan*.

Guerron-Quintana, P. (2012). Risk and uncertainty. *Federal Reserve Bank of Philadelphia, Quarterly Business Review Q1*(1), 10–18.

Guo, M. and H. Pan (2015). Can cross-listing relax financial frictions in trade and equity holdings? A sector-level analysis. *Applied Economics 47*(19), 2012–2029.

Haddow, A., C. Hare, T. Shakir, and J. Hooley (2013). Macroeconomic uncertainty: what is it, how can we measure it and why does it matter? *Bank of England Quarterly Bulletin Q2*(May), 100 – 109.

Haitsma, R., D. Unalmis, and J. de Haan (2016). The impact of the ECB's conventional and unconventional monetary policies on stock markets. *Journal of Macroeconomics 48*, 101–116.

Hajilee, M. and O. M. Al Nasser (2015). The Relationship between Financial Market Development and Foreign Direct Investment in Latin American Countries. *The Journal of Developing Areas 49*(2), 227–245.

Haldane, A., M. Roberts-Sklar, C. Young, and T. Wieladek (2016). QE: The Story so Far. *Bank of England Working Paper No.624 (London: Bank of England)*.

Harrison, A. E., I. Love, and M. S. McMillan (2004, oct). Global capital flows and financing constraints. *Journal of Development Economics 75*(1), 269–301.

Harrison, A. E. and M. S. McMillan (2003). Does direct foreign investment affect domestic credit constraints? *Journal of International Economics 61*(1), 73–100.

Hashem Pesaran, M. and R. P. Smith (2016). Counterfactual analysis in macroeconometrics: An empirical investigation into the effects of quantitative easing. *Research in Economics 70*(2), 262–280.

Hattari, R. and R. S. Rajan (2009, nov). Understanding bilateral FDI flows in developing Asia. *Asian-Pacific Economic Literature 23*(2), 73–93.

Hattari, R. and R. S. Rajan (2011). How Different are FDI and FPI Flows: Distance and Capital Market Integration. *Journal of Economic Integration 26*(3), 499–525.

Hausmann, R. and E. Fernandez-Arias (2000). Foreign Direct Investment : Good Cholesterol ? The New Wave of Capital Inflows : Sea Change or Just Another Tide ?

Head, K. and T. Mayer (2014). Chapter 3 Gravity Equations: Workhorse, Toolkit, and Cookbook. In *Handbook of International Economics*, Volume 4, pp. 131–195.

Head, K., T. Mayer, and J. Ries (2010). The erosion of colonial trade linkages after independence. *Journal of International Economics 81*(1), 1–14.

Head, K. and J. Ries (2008). FDI as an outcome of the market for corporate control: Theory and evidence. *Journal of International Economics 74*(1), 2–20.

Helpman, B. E., M. J. Melitz, and S. R. Yeaple (2004). Export versus FDI with Heterogeneous Firms. *The American Economic Review 94*(1), 300–316.

Helpman, E., M. Melitz, and Y. Rubinstein (2008). Estimating Trade Flows: Trading Partners and Trading Volumes. *The Quarterly Journal of Economics 123*(2), 441–487.

Hlaing, S. W. and M. Kakinaka (2019). Global uncertainty and capital flows : any difference between foreign direct investment and portfolio investment ? *Applied Economics Letters 26*(3), 202–209.

Honig, A. (2019). Elections and Capital Flows. *Journal of Money, Credit and Banking 0*(0).

Im, K. S., M. Pesaran, and Y. Shin (2003). Testing for unit roots in heterogeneous panels. *Economics Letters 115*(1), 53–74.

Jensen, M. C. and W. H. Meckling (1976). Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. *Journal of Financial Economics 3*, 305–360.

Jongwanich, J., D. H. Brooks, and A. Kohpaiboon (2013). Cross-border Mergers and Acquisitions and Financial Development: Evidence from Emerging Asia. *Asian Economic Journal 27*(3), 265–284.

Joyce, M. A., Z. Liu, and I. Tonks (2017). Institutional Investors and the QE Portfolio Balance Channel. *Journal of Money, Credit and Banking 49*(6), 1225–1246.

Ju, J. and S. Wei (2010). Domestic Institutions and the Bypass Effect of Financial Globalization. *American Economic Journal: Economic Policy 2*(4), 173–204.

Julio, B. and Y. Yook (2016). Policy uncertainty, irreversibility, and cross-border flows of capital. *Journal of International Economics 103*, 13–26.

Kao, C. and M.-H. Chiang (2000). On the estimation and inference of a cointegrated regression in panel data. In *B. Baltagi (ed) Advances in Econometrics*, Volume 15, pp. 179–222. Elsevier Science.

Kellard, N. M., A. Kontonikas, M. J. Lamla, G. Wood, N. M. Kellard, A. Kontonikas, M. J. Lamla, and S. Maiani (2018). Risk , Financial Stability and FDI. *Essex Finance Centre Working Paper Series*.

Khatiwada, S. (2017). Quantitative Easing by the Fed and International Capital Flows. *Graduate Institute Geneva Working Paper No. HEIDWP02-2017*.

Kinda, T. (2010). Investment Climate and FDI in Developing Countries: Firm-Level Evidence. *World Development 38*(4), 498–513.

Klein, M. W., J. Peek, and E. S. Rosengren (2002, jun). Troubled Banks, Impaired Foreign Direct Investment: The Role of Relative Access to Credit. *American Economic Review 92*(3), 664–682.

Kleinert, J. and F. Toubal (2010). Gravity for FDI. *Review of International Economics 18*(1), 1–13.

Koijen, R. S. J., F. Koulischer, B. Nguyen, and M. Yogo (2016). Quantitative Easing in the Euro Area: The Dynamics of Risk Exposures and the Impact on Asset Prices. *Bank of France Working Paper 601*(September), 1–50.

Krippner, L. (2016). Documentation for measures of monetary Policy. *Reserve Bank of New Zealand* (mimeo).

Krishnamurthy, A. and A. Vissing-jorgensen (2011). The Effects of Quantitative Easing on Interest Rates : Channels and Implications for Policy. *NBER Working Paper No. 17555, National Bureau of Economic Research Cambridge, Mass., USA*.

Kroszner, R., L. Laeven, and D. Klingebiel (2007). Banking crises, financial dependence, and growth. *Journal of Financial Economics 84*(1), 187–228.

Krugman, P. (2000). Fire-sale FDI. In *S. Edwards (ed) Capital Flows and the Emerging Economies: Theory, Evidence and Controversies*, pp. 43–58. University of Chicago Press.

Kuttner, K. N. (2001). Monetary policy surprises and interest rates: Evidence from the Fed funds futures market. *Journal of Monetary Economics 47*(3), 523–544.

La Porta, R., F. Lopez-de Silanes, and A. Shleifer (1998). Law and Finance. *Journal of Political Economy 6*, 1113–1155.

La Porta, R., F. Lopez-de Silanes, and A. Shleifer (2008). The Economic Consequences of Legal Origins. *Journal of Economic Literature 46*(2), 285–332.

Laeven, L. and F. Valencia (2013). Systemic Banking Crises Database. *IMF Economic Review 61*(2), 225–270.

Levine, R. (2005). Chapter 12 Finance and Growth: Theory and Evidence. *Handbook of Economic Growth 1*(SUPPL. PART A), 865–934.

Levy Yeyati, E., U. Panizza, and E. Stein (2007). The cyclical nature of NorthSouth FDI flows. *Journal of International Money and Finance 26*(1), 104–130.

Lim, J. J. and S. Mohapatra (2016). Quantitative easing and the post-crisis surge in financial flows to developing countries. *Journal of International Money and Finance 68*, 331–357.

Liu, Q. and L. D. Qiu (2014). Implications of Financial Development of the South for Trade and Foreign Direct Investment from the North. *Review of Development Economics 18*(2), 272–285.

Lo Duca, M., G. Nicoletti, and A. Vidal Martínez (2016). Global corporate bond issuance: What role for US quantitative easing? *Journal of International Money and Finance 60*, 114–150.

Loungani, P., A. Mody, and A. Razin (2002). The Global Disconnect: The Role of Transactional Distance and Scale Economies in Gravity Equations. *Scottish Journal of Political Economy 49*(5), 526–543.

Lucas, R. (1990). Why Doesn't Capital flow from Rich to Poor Countries. *The American Economic Review 80*(2), 92–96.

MacDonald, M. (2017). International capital market frictions and spillovers from quantitative easing. *Journal of International Money and Finance 70*, 135–156.

Manova, K. (2013). Credit constraints, heterogeneous firms, and international trade. *Review of Economic Studies 80*(2), 711–744.

Markusen, J. R. and K. E. Maskus (2002). Discriminating among alternative theories of the multinational enterprise. *Review of international economics 10*(4), 694–707.

McDonald, R. and D. Siegel (1986). The Value of Waiting to Invest. *The Quarterly Journal of Economics 101*(4), 707.

Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica 71*(6), 1695–1725.

Milesi-Ferretti, G. M. and C. Tille (2011). The great retrenchment: international capital flows during the global financial crisis. *Economic Policy 26*(66), 289–346.

Murinde, V. (2012). Financial Development and Economic Growth: Global and African Evidence. *Journal of African Economies 21*(AERC Supplement 2), i10–i56.

Myers, S. C. and N. S. Majluf (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics 13*(2), 187–221.

Neely, C. J. (2015). Unconventional monetary policy had large international effects. *Journal of Banking and Finance 52*, 101–111.

Nguyen, N. H. and H. V. Phan (2017). *Policy Uncertainty and Mergers and Acquisitions*, Volume 52.

Noe, T. H. (2000). Creditor Rights and Multinational Capital Structure.

Noria, G. L. and Z. J. J. Fernandez (2018). The Effect of Uncertainty On Foreign Direct Investment: The Case of Mexico. *Estudios Economicos 33*(1), 117–149.

Pedroni, P. (1999). Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors. *Oxford Bulletin of Economics and Statistics 61*(s1), 653–670.

Pedroni, P. (2000). Fully modified OLS for heterogenous cointegrated panels. In *B. Baltagi (ed) Advances in Econometrics*, Volume 15, pp. 93–150.

Pedroni, P. (2004). Panel Cointegration Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis. *Econometric Theory 20*(3), 597–625.

Portes, R. and H. Rey (2005a). The determinants of cross-border equity flows. *Journal of International Economics 65*(2), 269–296.

Portes, R. and H. Rey (2005b). The Determinants of Cross-Border Equity Flows. *Journal of international Economics 65*(2), 269–296.

Raddatz, C. and S. L. Schmukler (2012). On the international transmission of shocks: Micro-evidence from mutual fund portfolios. *Journal of International Economics 88*(2), 357–374.

Rajan, R. G. and L. Zingales (1998). Financial Dependence and Growth. *The American Economic Review 88*(2), 559–586.

Razin, A. and E. Sadka (2007). *Foreign Direct Investment: Analysis of Aggregate Flows*. Princeton University Press.

Rey, H. (2015). Dilemma not trilemma: The Global Financial Cycle and Monetary Policy Independence. *NBER Working Paper No. 21162, National Bureau of Economic Research Cambridge, Mass., USA*.

Rogers, J. H., C. Scotti, and J. H. Right (2014). Evaluating Asset-Market effects of unconventional monetary policy: a multi-country view. *Economic Policy 29*(80), 749–799.

Rogers, J. H., C. Scotti, and J. H. Wright (2016). Unconventional Monetary Policy and International Risk Premia. *International Finance Discussion Papers 2016*(1172), 1–30.

Rose, A. K. (2018). Currency Wars? Unconventional Monetary Policy Does Not Stimulate Exports. *NBER Working Paper Series W24817*.

Saito, M. and Y. Hogen (2014). Portfolio Rebalancing Following the Bank of Japan' s Government Bond Purchases : Empirical Analysis Using Data on Bank Loans and Investment Flows. *BOJ Reports & Reseach Papers* (June).

Sauvant, K., G. McAllister, and W. A. Maschek (2010). *Foreign Direct Investments from Emerging Markets*. Palgrave MacMillan: New York.

Schmidt, T. and L. Zwick (2015). Uncertainty and episodes of extreme capital flows in the Euro Area. *Economic Modelling 48*, 343–356.

Shepard, B. (2012). *The Gravity Model of International Trade: A User Guide*.

Silva, J. and S. Tenreyro (2006). The Log of Gravity. *The Review of Economics and 88*(November), 641–658.

Solomon, B. and I. Ruiz (2012). Political Risk, Macroeconomic Uncertainty, and the Patterns of Foreign Direct Investment. *International Trade Journal 26*(2), 181–198.

Stephan, M. and E. Pfaffmann (2001). Detecting the Pitfalls of Data on Foreign Direct Investment: Scope and Limits of FDI Data. *Management International Review (MIR) 41*(2), 189–218.

Stoddard, O. and I. Noy (2015). Fire-sale FDI ? The Impact of Financial Crises on Foreign Direct Investment. *Review of Development Economics 19*(2), 387–399.

Stone, S. F. and B. N. Jeon (2000). Foreign Direct Investment and Trade in the Asia-Pacific Region: Complementarity, Distance and Regional Economic Integration. *Journal of Economic Integration 15*(3), 460–485.

Tille, C. and E. Van Wincoop (2014). International capital flows under dispersed private information. *Journal of International Economics 93*(1), 31–49.

UNCTAD (2013). World Investment Report 2013: Global Value Chains: Investment and Trade for Development. Technical report.

UNCTAD (2014). World Investment Report 2014: Investing in the SDGs: An Action Plan. Technical report.

Wacker, K. M. (2016). (When) Should We Use Foreign Direct Investment Data to Measure the Activities of Multinational Corporations? Theory and Evidence. *Review of International Economics 24*(5), 980–999.

Wang, Y. (2018). Fickle capital flows and retrenchment: Evidence from bilateral banking data. *Journal of International Money and Finance 87*, 1–21.

Wei, S.-J. (2000). How taxing is corruption on international investors? *The Review of Economics and Statistics 82*(1), 1–11.

Westerlund, J. and F. Wilhelmsson (2011). Estimating the gravity model without gravity using panel data. *Applied Economics 43*(6), 641–649.

Wu, J. C. and F. D. Xia (2016). Measuring the Macroeconomic Impact of Monetary Policy at the Zero Lower Bound. *Journal of Money, Credit and Banking 48*(2-3), 253–291.