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Berlin, May 2019 *Tatsiana Kliatskova*

Erklärung zu Ko-Autorenschaften

Diese Disseration besteht aus drei (Arbeits-)Papieren, von denen zwei in Zusammenarbeit mit einem Koautor entstanden sind. Der Eigenanteil an Konzeption, Durchführung und Berichtsabfassung der Kapitel lässt sich folgendermaßen zusammenfassen:

- Tatsiana Kliatskova
  "Capital Controls and Macroprudential Policies: Are they countercyclical?"
  Eigenanteil: 100 Prozent

- Tatsiana Kliatskova und Uffe Mikkelsen
  "Floating with a Load of FX Debt?"
  Eigenanteil: 50 Prozent

- Franziska Bremus und Tatsiana Kliatskova
  "Legal Harmonization, Institutional Quality, and Countries' External Positions: A Sectoral Analysis"
  Eigenanteil: 50 Prozent

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List of Abbreviations

AREAER Annual Report on Exchange Arrangements and Exchange Restrictions

BoP balance of payment

CC capital controls

CFM capital flow management

CMU Capital Markets Union

COFER Currency Composition of Official Foreign Exchange Reserves

CPIS Coordinated Portfolio Investment Survey

EA euro area

EBA extreme bounds analysis

EC European Commission

EMBI Emerging Markets Bond Index

EMEs emerging market economies

ER exchange rates

EU European Union

FCI financial conditions indicator

FCL Flexible Credit Line Agreement

FDI foreign direct investment

FSAP Financial Services Action Plan

FX foreign exchange

FXD foreign exchange debt

FXI foreign exchange interventions

GDP gross domestic product

IMF International Monetary Fund

LTV loan-to-value

MP macroprudential policies

NEER nominal effective exchange rates

NF non-finanical private sector

NFA net foreign assets

NFC non-financial corporations

OECD Organisation for Economic Co-operation and Development

OFC other financial corporations

REER real effective exchange rates

RR reserve requirements

USD US dollar

VIX CBOE Volatility Index

WB World Bank

Summary

Opinions regarding capital account openness have been undergoing changes. On the one hand, financial liberalization and integration are viewed as sources of economic growth and prosperity due to a better allocation of capital to productive uses. In addition, free capital mobility and access to foreign capital are considered to be important facilitators of investment as well as cross-border risk sharing. On the other hand, during the global financial crisis, free capital mobility was blamed for exchange rate overvaluation, overborrowing, fueling of credit booms, asset price bubbles, and sudden stops. Policymakers in emerging market economies claim that the risk of macroeconomic and financial instability increases due to large and volatile global capital flows. Chapters 1 and 2 of this dissertation analyze policies, such as capital flow management measures, monetary policy, and foreign exchange (FX) interventions, that are implemented by policymakers in emerging market economies with the aim of smoothing economic and financial fluctuations. Chapter 3 assesses the determinants of capital market integration in Europe, motivated by the benefits that cross-border capital flows can bring to economies.

The first chapter presents a novel dataset on the easing and tightening of capital controls on inflows and outflows for 24 emerging market economies for the 1997-2014 period at a quarterly frequency. The indexes on capital controls and an index on macroprudential policies (Cerutti et al., 2017b) are then used to estimate policy reaction functions that examine the motivation for a time-varying adjustment of these policy measures. According to both the theoretical literature and policymakers, such as the International Monetary Fund, macroprudential policies and controls on net capital inflows should be used in a countercyclical manner in order to smooth business and financial fluctuations. Indeed, the empirical findings of this chapter show that adjustment of macroprudential policies and capital controls on inflows can be largely explained by changing global financial conditions; that is, the policies are used to limit exposure to international capital flows. However, the pattern of loosening and tightening of macroprudential policies and capital controls varies across instruments and categories of assets as well as exhibits some heterogeneity across countries with different income levels, external indebtedness, and exchange rate regimes.

The second chapter analyzes, using a sample of 15 emerging market economies, whether countries with a large foreign exchange debt in the non-financial private sector tend to react more strongly to exchange rate changes using both FX interventions and monetary policy. As empirical observations suggest, countries with *de jure* floating exchange rate regimes are often reluctant to allow their currencies to float freely in practice. One reason why countries may wish to limit exchange rate volatility is potential negative balance sheet effects due to currency mismatches on the balance sheets of firms and households. This chapter supports the idea that an important source of "fear of floating" is balance sheet currency mismatches. This effect is asymmetric; that is, countries stem depreciation, but not appreciation pressure.

The third chapter assesses the potential for legal harmonization and convergence in institutional quality to affect financial structures in Europe. The chapter is motivated by the Action Plan for a European Capital Markets Union, which aims to deepen and integrate financial markets in the European Union (EU) through standardization and harmonization of financial regulations. Based on self-collected data on the implementation of the EU-Directives, the analysis suggests that legal harmonization promotes portfolio equity holdings, while discrepancies in institutional quality, such as insolvency procedures, investor protection, and tax systems, matter primarily for cross-border debt positions. In addition, the relationship between external investments and harmonization of regulations vary significantly across sectors. The results are driven by the investments of institutional investors.

Zusammenfassung

Die Meinungen über Kapitalmarktöffnung haben sich immer wieder geändert. Auf der einen Seite werden die Liberalisierung und Integration von Finanzmärkten als begünstigender Faktor für Wirtschaftswachstum und Wohlstand angesehen, da sie zu einer produktiveren Allokation von Kapital beitragen. Außerdem werden freier Kapitalverkehr und Zugang zu Auslandskapital als wichtige Faktoren für Investitionen und grenzüberschreitende Risikoteilung gesehen. Auf der anderen Seite wurden dem freien Kapitalverkehr Verantwortung für Überbewertungen von Währungen, Überschuldung, zu hohe Kreditbereitschaft, Vermögenspreisblasen und plötzliche Unterbrechungen von Finanzströmen zugewiesen. Politische Entscheidungsträger in Schwellenländern haben zudem behauptet, dass das Risiko makroökonomischer und finanzieller Instabilität mit großen und volatilen internationalen Kapitalflüssen ansteigt. Kapitel 1 und 2 dieser Doktorarbeit widmen sich der Analyse von Maßnahmen, die von Entscheidungsträgern in Schwellenländern implementiert werden, um wirtschaftliche und finanzielle Schwankungen zu reduzieren, wie zum Beispiel das Management von Kapitalflüssen, Geldpolitik und Wechselkursinterventionen. Kapitel 3 untersucht die Einflussfaktoren der Kapitalmarktintegration in Europa motiviert durch die Vorteile, die grenzüberschreitender Kapitalverkehr für die beteiligten Länder mit sich bringen kann.

Das erste Kapitel beschreibt einen neuartigen Datensatz von Lockerungen und Straffungen der Kontrollen von Kapitalzuflüssen und Kapitalabflüssen für 24 Schwellenländer über den Zeitraum 1997-2014 bei vierteljährlicher Frequenz. Die konstruierten Indizes für Kapitalverkehrskontrollen und ein Index für makroprudenzielle Maßnahmen (Cerutti et al., 2017b) werden anschließend dafür verwendet, Funktionen zu schätzen, mit denen die Motivation für zeitlich variierende Anpassungen dieser Maßnahmen untersucht werden kann. Die theoretische wissenschaftliche Literatur und Äußerungen von internationalen Entscheidungsträgern, wie zum Beispiel dem Internationalen Währungsfond, legen nahe, dass die antizyklische Verwendung von makroprudenziellen Maßnahmen und Kapitalkontrollen für Netto-Kapitalzuflüsse für Volkswirtschaften vorteilhaft sind, da sie konjunkturelle und finanzielle Zyklen glätten können. Die Ergebnisse zeigen, dass Anpassungen von makro-

prudenziellen Maßnahmen und Kapitalkontrollen für Kapitalzuflüsse zum Großteil mit wechselnden globalen finanziellen Bedingungen erklärt werden können. Das bedeutet, dass die Maßnahmen dafür verwendet werden, die Exposition gegenüber dem internationalen Kapitalverkehr zu reduzieren. Das Muster der Lockerung und Straffung von makroprudenziellen Maßnahmen und Kapitalverkehrskontrollen variiert hinsichtlich der betrachteten Maßnahmen und Vermögensarten und weist einige Heterogenität zwischen Ländern mit unterschiedlichen Einkommensniveaus, Auslandsverschuldungsquoten und Wechselkursregimen auf.

Das zweite Kapitel untersucht anhand einer Stichprobe von 15 Schwellenländern, ob Länder mit einer hohen Auslandsverschuldung im nicht finanziellen Privatsektor tendenziell stärker mit Wechselkursinterventionen und Geldpolitik auf Wechselkursänderungen reagieren. Empirische Beobachtungen legen nahe, dass Schwellenländer mit einem *de jure* freien Wechselkursregime oft zögerlich sind, ihre Währungen in der Praxis tatsächlich frei schwanken zu lassen. Ein Grund dafür, dass Länder versuchen, die Volatilität ihrer Wechselkurse zu reduzieren, sind mögliche negative Effekte wegen der Währungsdifferenzen in den Bilanzen von Unternehmen und privaten Haushalten. Das Kapitel unterstützt die Idee, dass Währungsdifferenzen in Bilanzen ein wichtiger Grund für die sogenannte "fear of floating" sind. Der Effekt ist asymmetrisch in der Hinsicht, dass Länder Abwertungsdruck aushalten, nicht jedoch Druck zur Aufwertung ihrer Währung.

Das dritte Kapitel widmet sich den Auswirkungen rechtlicher Harmonisierung und der Konvergenz der institutionellen Qualität auf die Finanzmarktstrukturen in Europa. Das Kapitel ist durch den Aktionsplan für eine Europäische Kapitalmarktunion motiviert, der durch Standardisierung und Harmonisierung von Finanzmarktregeln eine Vertiefung und Integration der Finanzmärkte in der EU anstrebt. Auf Basis eines selbstständig erstellten Datensatzes zur Implementierung von EU-Richtlinien zeigen die Ergebnisse, dass rechtliche Harmonisierung grenzüberschreitende Investitionen in Aktien befördert. Unterschiede in der institutionellen Qualität, zum Beispiel hinsichtlich Insolvenzverfahren, Schutz von Investoren und Steuersysteme, sind in erster Linie für die Integration der Anleihemärkte von Bedeutung. Die Beziehung zwischen Auslandsinvestitionen und Harmonisierung der Regulierung variiert zudem deutlich über die verschiedenen Sektoren. Die Ergebnisse werden am stärksten von den Investitionen institutioneller Investoren geprägt.

Introduction and Overview

The debate on whether free cross-border movement of capital is beneficial for the economy and how to deal with volatile capital flows resumed since the global financial crisis of 2007-2009. Capital inflows (Figure 0.1) to both advanced and developing economies were steadily growing prior to 2007 and then significantly dropped, coinciding with the global financial crisis that affected a large number of countries simultaneously. While capital flows can be beneficial for economic growth and development, they can also bring potential risks for economic and financial stability, with short-term debt flows being especially disruptive. At the same time, capital flows in the form of foreign direct investment (FDI) and equity are considered to be rather stabilizing (Milesi-Ferretti et al., 2011). The ability of countries to handle the risks and extract the benefits of capital flows crucially depends on the quality of their policies and institutions (Fratzscher and Imbs, 2009). Sound macroeconomic policies and efficient regulations of the financial sector as well as a developed banking sector and financial markets are important prerequisites for successful capital account liberalization (Kose et al., 2006, 2011).

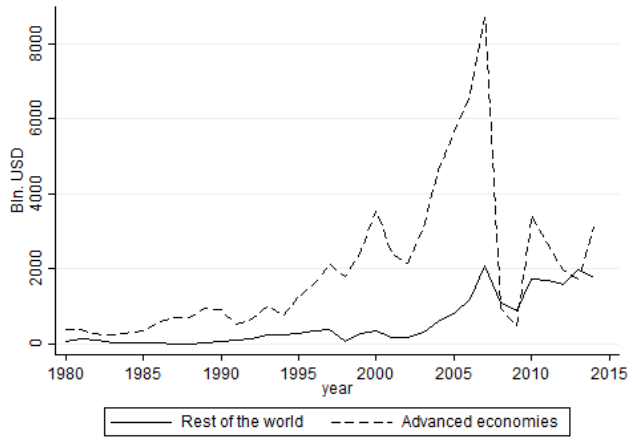

Figure 0.1: Capital inflows, 1980-2015. *Note:* The Figure displays capital inflows (FDI, portfolio debt and equity, and credit) to advanced economies and the rest of the world for the 1980-2015 period. Advanced economies include 22 OECD economies. *Source:* The updated and extended version of the dataset of net private and public capital flows constructed by Alfaro et al. (2014), based on the IMF IFS.

The widespread view pioneered by Solow (1956) is that open and well-functioning financial markets are important facilitators of economic growth and better standards of living. Liberalization of the capital account allows countries with an abundance of capital to transfer it to countries with scarce capital. As a result of lower costs of borrowing and better access to foreign capital, investments and economic growth tend to increase. In addition, economic growth is spurred via efficiency gains that come with improvement of technologies and organizational structures (Henry, 2007). Further, developed financial markets allow for better cross-border risk sharing and consumption smoothing, especially via equity markets (Kose et al., 2009; Milesi-Ferretti et al., 2011; Bremus and Buch, 2018).

At the same time, the literature points out that capital markets are prone to herding behavior and panics due to incomplete information, moral hazards, and adverse selection (Stiglitz, 2000) and capital does not always flow to countries with the fastest productivity growth (Gourinchas and Jeanne, 2013). Moreover, volatile capital inflows and outflows can be disruptive for an economy and may result in sudden stops and reversals of capital (Reinhart and Reinhart, 2008). Policymakers in emerging market economies (EMEs) claim that the risk of macroeconomic and financial instability increases due to large and volatile global capital flows that are often speculative. Around the global financial crisis, free capital mobility was blamed for exchange rate overvaluation, overborrowing, fueling of credit booms, asset price bubbles, and sudden stops, in both emerging markets and advanced economies (IMF, 2011).

Due to the disruptive nature of speculative capital flows, many countries try to limit capital inflows and prevent huge capital outflows by introducing capital controls (e.g., Brazil 2008-2010, Colombia 2007-2008). IMF (2011) suggests that restrictions on net capital inflows and macroprudential regulations should be tightened during booms and relaxed during busts in business and financial activities; that is, these policies should be used countercyclically. As the theoretical literature shows, used this way, capital controls can promote financial stability (Jeanne and Korinek, 2010; Benigno et al., 2016) and improve macroeconomic adjustment (Schmitt-Grohé and Uribe, 2016).

The **first chapter**, *Capital controls and macroprudential policies: Are they countercyclical?*, provides empirical evidence on the factors that motivate policymakers in emerging market economies to adjust macroprudential policies and capital controls. More specifically, I investigate whether controls on net capital inflows and macroprudential policies have been adjusted in a countercyclical manner throughout global and local business as well as financial cycles. To this end, I construct a new index on the adjustment – tightening and easing – of capital controls on inflows and outflows for five types of assets (portfolio debt, portfolio equity, FDI, credit, and derivatives) in 24 emerging economies for the 1997-2014 period at a quarterly frequency. The constructed indexes and the macroprudential policy

index by Cerutti et al. (2017b) are then related to global and local cyclical components of gross domestic product (GDP), credit to private non-financial corporations, real effective exchange rates, and financial conditions indicators. For that, I apply policy reaction functions to capital flow management (CFM) policies, assuming that a policymaker chooses between tightening, easing, and not changing CFM measures after observing all available information on global as well as local economic and financial developments. The findings suggest that adjustment of macroprudential policies and capital controls on inflows can be largely explained by changing global financial conditions. In addition, I show that the pattern of loosening and tightening of macroprudential policies and capital controls varies across instruments and categories of assets as well as exhibits some heterogeneity across countries with different income levels, external indebtedness, and exchange rate regimes.

Chapter 1 contributes to the literature, first, by constructing a novel dataset on the tightening and easing of capital controls on outflows and inflows. The most widely used measures of capital controls, such as the ones by Chinn and Ito (2006) and Fernandez et al. (2015a), did not provide information on changes in the existing restrictions. At the same time, the indexes constructed for this chapter capture time-varying adjustments of the restrictions and provide a detailed information on the tightening and easing of the restrictions on different types of assets. Second, the chapter analyzes whether local or global economic and financial developments motivate policymakers to adjust capital controls and macroprudential policies, while previous empirical studies (Fratzscher, 2012; Aizenman and Pasricha, 2013; Pasricha, 2017) looked solely at local cycles. The results of this chapter, however, suggest that policies in EMEs are sensitive to global cycles due to the dependence of economies on capital inflows.

Another concern regarding economic and financial stability in emerging market economies lies in the choice of exchange rate regime. As compared to pegs, floating exchange rate regimes are considered to be more efficient in absorbing shocks and can serve as stabilizers of the economy (Eichengreen, 2016). Nevertheless, countries that often claim to be floating are in fact not (Calvo and Reinhart, 2002). Many emerging market economies try to limit exchange rate volatility due to a lack of credibility of the central banks' policies, high pass-through from exchange rates to prices, or negative balance sheet effects from exchange rate movements. Capital flows can affect exchange rates in two ways. First, capital inflows are associated with an appreciation of exchange rates and a subsequent loss of competitiveness of domestic firms. Second, capital outflows might lead to depreciation of exchange rates, which may affect balance sheets of borrowers that obtain financing in foreign currencies. Therefore, to smooth exchange rate movements, policymakers often use capital flow management measures, monetary policy, or FX interventions.

The **second chapter**, *Floating with a load of FX debt?*, is a joint work with Uffe

Mikkelsen. It assesses whether countries with high FX debt in the non-financial private sector tend to react more strongly to exchange rate pressure using monetary policy and FX interventions. As the empirical observations by Calvo and Reinhart (2002) suggest, many emerging market economies use interest rates and FX interventions, among others, to stabilize exchange rates. One of the possible explanations for the "fear of floating" are negative balance sheet effects of exchange rate volatility when debt is denominated in a foreign currency. This chapter tests this hypothesis in a panel setup, using monthly data for 15 emerging market economies for the 2002-2015 period. We estimate two separate equations for FX interventions and policy rates and analyze whether the correlation between policy instruments and exchange rate changes is amplified by the stock of FX debt that non-financial private sector holds. The results suggest that indeed the level of FX debt affects the sensitivity of the instruments – FX interventions and policy rates – to exchange rate changes. This finding supports the idea that an important source of the "fear of floating" are balance sheet currency mismatches. This effect is asymmetric; that is, countries stem depreciation, but not appreciation pressure. Moreover, FX debt financed through the domestic banking system is more important for the "fear of floating" than FX debt obtained directly from external sources.

Chapter 2 contributes to the literature by examining the influence of private sector FX exposures on central banks' policies and accounting directly for externally and domestically financed FX borrowing, while previous studies considered only liability dollarization of the domestic banking system (Honig, 2005; Harms and Hoffmann, 2011). That allows the provision of focused policy recommendations on the importance of reducing specific types of debt. In addition, the chapter distinguishes between the effect of exchange rate depreciation and appreciation, revealing that currency depreciation may threaten financial stability due to balance sheet effects.

Finally, being motivated by the benefits that developed financial markets and free capital mobility may bring, I look at the Action Plan for the European Capital Markets Union (CMU) that was launched in 2015. The EU capital market is rather underdeveloped as compared to those of other advanced economies, such as the USA or Japan (Langfield and Pagano, 2016). Moreover, the financial markets in the EU remain national and cross-border financial integration is rather limited (European Commission, 2015). The Action Plan aims to promote capital market integration in Europe and further deepen debt and equity markets. By investigating potential determinants of cross-border debt and equity investment, the literature provides ample evidence that information frictions between countries due to differences in language and legal origins, along with deep-rooted preferences and habits, can explain a significant part of cross-border equity and debt holdings (Grinblatt and Keloharju, 2001; Okawa and van Wincoop, 2012; Giofre, 2013a; Roque and

Cortez, 2014; Giofre, 2017).

The **third chapter**, *Legal harmonization, institutional quality, and countries' external positions: A sectoral analysis*, is a joint work with Franziska Bremus. It analyzes legal and institutional determinants of countries' external debt and equity positions for a large sample of advanced economies, with a focus on EU countries. More specifically, it assesses whether harmonization of financial regulations (as suggested by the Action Plan) can support capital market integration. In addition, it investigates how cross-country differences in the quality of institutional variables, such as insolvency recovery rates, strength of investor protection, coverage of credit registries, and efficiency of tax and contract laws, are related to cross-border portfolio debt and equity investment. The results suggest that, first, legal harmonization promotes portfolio equity holdings. Second, discrepancies in institutional quality matter primarily for cross-border debt positions. Third, the relationship between external investments and harmonization of regulations varies significantly across sectors: the non-bank financial corporations, which account for a large share of portfolio positions, react more to institutional harmonization than banks and the non-financial private sector.

Chapter 3 contributes to the literature by constructing a bilateral index on legislative harmonization of financial regulations in the EU and analyzing its effect on capital market integration. The index of legislative harmonization by Kalemli-Ozcan et al. (2010) is extended by collecting the dates of the transposition of the EU-Directives in the area of financial regulations by the new member states as well as by including information on the new EU-Directives that were introduced post-crisis. In addition, the chapter studies the potential of legislative harmonization and convergence in institutional quality to promote capital market integration, while previous literature analyzed effects on banking integration (Kalemli-Ozcan et al., 2010; Houston et al., 2012). Finally, it analyzes the determinants of international investment positions at the sectoral level, while most of the previous gravity studies were based on aggregate data (Okawa and van Wincoop, 2012).

Chapter 1

Capital Controls and Macroprudential Policies: Are they Countercyclical?

1.1 Introduction

The ability of capital flow management (CFM) measures, macroprudential policies (MP) and capital controls (CC), to smooth economic and financial fluctuations by putting "sand in the wheels" of international borrowing (by Tobin, 1978) is widely debated by academics and policymakers (IMF, 2011). The theoretical literature suggests that restrictions on net capital inflows and macroprudential regulations should be tightened during booms and relaxed during busts; this way CFM measures promote financial stability (Jeanne and Korinek, 2010; Benigno et al., 2016) and improve macroeconomic adjustment (Schmitt-Grohé and Uribe, 2016). Additionally, Korinek and Sandri (2016) show that it is desirable to employ both types of instruments as macroprudential regulations reduce indebtedness of leveraged borrowers, while capital controls induce more precautionary behavior for the economy as a whole.

Indeed, during the global financial crisis of 2007-2009, many emerging market economies (EMEs) reintroduced capital controls on inflows (e.g., Brazil 2008-10, Colombia 2007-08) using them as a countercyclical tool. At the same time, some countries with capital controls in place, like China and India, have been gradually liberalizing their capital accounts with no regard to business or financial developments. Additionally, many countries started using macroprudential policies not only as domestic prudential regulations, but also as tools for managing capital flows. In this paper, I investigate whether controls on net capital inflows and macroprudential policies have indeed been adjusted in a countercyclical manner throughout business and financial cycles, as suggested by the theoretical literature and as advised by the international organizations. In addition, I examine whether use

of capital flow management measures is driven by global or local economic and financial developments.

To this end, I construct a novel dataset on the tightening and easing of capital controls on outflows and inflows for 5 types of assets (portfolio equity, portfolio bonds, FDI, credit, and derivatives) in 24 emerging market economies for the 1997-2014 period at a quarterly frequency. The existing datasets on capital controls mostly gauge the existence of policies at aggregated (Chinn and Ito, 2006) or disaggregated (Fernandez et al., 2015a) levels. They describe whether capital controls are in place or not for a given country in a certain year. Yet, they do not capture time-varying adjustments of the restrictions. Other datasets, such as Pasricha (2012), Ahmed et al. (2015), Chantapacdepong and Shim (2015), and Garcia (2017), account for subsequent changes of capital controls by incorporating tightening and easing of the policies. The dataset constructed for this paper contributes to the efforts to measure changes in capital controls and improves on country, time, and asset type coverage. As the subsequent analysis suggests, more granular data on capital controls with a disaggregation by asset type and direction of the policy is needed as policymakers may have different motivation for tightening and easing of the policies for various types of assets. Additionally, I construct an index of capital controls on outflows, while the existing literature, with the exception of Pasricha (2012) and Garcia (2017), only concentrates on capital controls on inflows.

The constructed capital controls indexes and the macroprudential policy indexes by Cerutti et al. (2017b) are related to global and local cyclical components of GDP, credit to private non-financial corporations (NFC), real effective exchange rates (REER), and financial conditions indicator (FCI). To this end, I apply policy reaction functions that are common in monetary policy literature to CFM policies. I estimate logit and multinomial logit models, assuming for the latter that a policymaker chooses between tightening, easing, and not changing CFM measures after observing all available information on global as well as local economic and financial developments. The main results of this paper suggest that capital controls on inflows and macroprudential policies are used countercyclically with respect to global financial variables. Adjustment of these policies can be largely explained by changing global financial conditions. For example, when financial conditions tighten, the probability of easing macroprudential policies and capital controls on inflows increases to 60% and 20%, respectively. At the same time, capital controls on outflows behave somewhat procyclically throughout local business and financial cycles.

Further, the behavior of CFM measures varies across prudential instruments and capital restrictions on different categories of assets. Local and foreign reserve requirements (RR) as well as loan-to-value (LTV) ratios behave countercyclically, while adjustment of the other instruments is not related to the cycles. Additionally, the results obtained for

capital controls on inflows are mostly driven by restrictions on credit flows. Yet, adjustment of the restrictions on the other capital inflows is related to changing global financial conditions. Finally, countries apply different instruments, macroprudential policies *versus* capital controls on net capital inflows, and strategies, countercyclical *versus* acyclical use of CFM policies, depending on their income level, external indebtedness, and exchange rate regime. Overall, the results support findings of the theoretical literature on cyclicality of CFM measures, with an important distinction between global and local cycles. The paper suggests that global developments, and especially global financial conditions, are important in shaping the use of capital flow management measures.

The findings of this paper are related to studies on cyclicality of CFM measures. For capital controls, there is no consensus in the literature on whether they are imposed and adjusted countercyclically or not. While Fernandez et al. (2015b) find that capital controls are largely acyclical, Fratzscher (2012), Aizenman and Pasricha (2013), and Pasricha (2017) show that capital controls are adjusted based on concerns about an overheating of the domestic economy as well as FX policy objectives. My study contributes to the existing literature by relating capital controls to both global and local cycles, thus showing that these policies might be affected by developments abroad. Additionally, the analysis is performed for capital controls on inflows and outflows disaggregated by categories of assets, while the existing studies analyzed aggregated indexes. A more granular approach accounts for heterogeneous preferences of policymakers in adjusting capital controls on more volatile debt, equity, and credit flows as compared to rather stable FDI flows.

For macroprudential policies, Cerutti et al. (2017b) and Federico et al. (2014) find that reserve requirements are used in a countercyclical manner with respect to domestic cycles defined by GDP gap and credit growth. My paper adds to the literature by analyzing behavior of macroprudential policies throughout global business and financial cycles suggesting that macroprudential policies might be used by policymakers to regulate capital flows. Further, I analyze a larger number of macroprudential instruments, thus providing some additional insights on importance of and motivation for different types of regulations.

The remainder of the paper is organized as follows. Section 1.2 provides literature review and derives hypotheses. Section 1.3 describes data on capital controls and macroprudential policies as well as provides definitions for financial and business cycles. Section 1.4 performs unconditional correlation analysis between CFM indexes and the main financial and macroeconomic variables as well as studies behavior of CFM measures around the global financial crisis of 2007-2009. Section 1.5 describes econometric methodology and discusses the main empirical findings on the (counter-)cyclical adjustment of capital controls and macroprudential policies. In addition, this Section presents robustness tests of the results and extensions of the model. Section 1.6 concludes.

1.2 Literature review and hypotheses

This paper aims to assess whether central banks and other regulators systematically adjust, tighten or ease, macroprudential policies and capital controls on net capital inflows in a countercyclical manner. Therefore, it is directly related to the following strands of literature: (1) datasets on existence and adjustment of capital controls and macroprudential policies; and (2) (counter-)cyclical adjustment of capital flow management measures throughout financial and business cycles.

Databases on capital controls and macroprudential policies. First, there is a growing number of datasets on the level of, and change in, capital account restrictions. Cross-country time series of capital controls are usually drawn from the International Monetary Fund (IMF) Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) and are sometimes supplemented by country-specific information from news and press releases. These datasets are mostly used to analyze effectiveness of the policies. The first type of dataset measures the existence of capital controls aggregated across different asset classes, as in Chinn and Ito (2006), or at a disaggregated level, as in Schindler (2009) and Fernandez et al. (2015a). The dataset by Fernandez et al. (2015a) presents information on capital restrictions on inflows and outflows for 10 categories of assets for 100 countries between 1995 and 2014 at an annual frequency. It codes capital controls as one if there are some restrictions in place and zero, otherwise. These measures, however, do not capture time-varying changes in the intensity of restrictions. For example, Brazil changed IOF, the tax on portfolio inflows, four times during the 2008-2010 period. This change in intensity is not reflected in the datasets discussed above and it is simply coded as a presence of the capital control.

The second type of datasets accounts for subsequent adjustment of capital controls by incorporating tightening and easing of the policies. These datasets are presented in papers by Pasricha et al. (2017), Garcia (2017), Forbes et al. (2015), Chantapacdepong and Shim (2015), and Ahmed and Zlate (2014). The datasets usually cover either a short time span or a small number of countries. The datasets that are the closest to this paper are those by Pasricha et al. (2017) and Ahmed et al. (2015). Pasricha et al. (2017) calculates the number of easing and tightening steps for capital controls on inflows and outflows for 17 emerging market economies between 2001 and 2011 at a daily frequency, disaggregating them by an assets type and classifying them into quantitative, monitoring, and price-based measures. Then a cumulative index is constructed by weighting changes in policies by the share of country's total international assets or liabilities that the measure is designed to influence. Ahmed et al. (2015) calculates the number of steps that countries undergo to put new restrictions in place, tighten or ease them, or remove them altogether. The indexes

measure capital controls on inflows for four types of assets (portfolio equity, portfolio bond, FDI, and credit) for 19 countries between 2002 and 2012 at a quarterly frequency.

Second, there are a few global datasets on macroprudential policies. In particular, Lim et al. (2011) present a dataset of 10 types of macroprudential measures for 42 economies over the 2000-2010 period. Further, the Global Macroprudential Policy Instruments Survey by the IMF covers 125 countries and provides a comprehensive overview of the timing and use of different macroprudential policies across 125 countries. The information is provided by country authorities and it is cross-checked by IMF country desk economists. Using this survey, the dataset by Cerutti et al. (2017a) documents the use of macroprudential policies for 119 countries over the 2000-2013 period, covering 12 instruments. My paper relies on the dataset by Cerutti et al. (2017b) that focuses on changes in intensity in the use of 5 types of prudential tools (capital buffers, interbank exposure limits, concentration limits, LTV limits, and reserve requirements) for 64 countries over the 2000-2014 period at a quarterly frequency.

Cyclicality of CFM measures. Based on the theoretical literature, capital controls on net capital inflows and macroprudential policies that are imposed in a countercyclical manner can promote financial stability (Jeanne and Korinek, 2010; Benigno et al., 2016; Korinek and Sandri, 2016) and improve macroeconomic adjustment (Schmitt-Grohé and Uribe, 2016). Therefore, policymakers should tighten capital controls on inflows and relax them on outflows during expansions, and *vice versa* during contractions. Similarly, prudential regulations should be strengthened during periods of high growth and loosened during recessions.

Empirically, a number of papers relate capital flow management measures to local financial and business cycles. Fernandez et al. (2015b) find that capital controls are remarkably acyclical; that is, there is no movement in capital controls during booms and busts in aggregate activity. More formally, Fratzscher (2012) shows that the (re-)introduction and persistence of capital controls was motivated by FX policy objectives and concerns about an overheating of the domestic economy. Using data on changes in capital controls, Aizenman and Pasricha (2013) claim that capital controls on outflows were adjusted due to overheating and foreign exchange valuation concerns arising from net capital inflows pressure as well as for financial and macroeconomic stabilization reasons. Additionally, Pasricha (2017) finds that policymakers respond to mercantilists concerns, that is promotion of exports by manipulating the terms of trade or preventing foreign control of strategic industries, by using both instruments – inflow tightening and outflow easing. At the same time, only inflow tightening is used in response to macroprudential concerns.

For macroprudential policies, Cerutti et al. (2017b) find that LTV ratios and reserve requirements are used in a countercyclical fashion with regard to local credit, policy rates,

and house prices by many countries, while the other macroprudential instruments are aimed at achieving structural objectives. Federico et al. (2014) claim that around two-thirds of developing countries have used reserve requirements as a macroeconomic stabilization tool substituting monetary policy that is usually procyclical.

Hypotheses. Relying on theoretical and empirical literature, this study tests the hypotheses presented below. *Hypothesis 1: Policymakers adjust macroprudential policies and capital controls on net capital inflows in a countercyclical manner throughout global as well as local business and financial cycles (as measured by GDP and credit to private NFC gaps, respectively).* When there is a surge in local or global economic and/or financial activities, policymakers tighten macroprudential policies and capital controls on inflows in order to constrain international and domestic borrowing and, thus, limit overheating of the economy. The opposite happens in times of busts as easing of the policies should attract additional capital from abroad and, in turn, facilitate investment and consumption. Further, capital controls on outflows are tightened during recessions so that capital does not fly away from the country, and *vice versa* during boosts. This way, macroprudential policies and restrictions on net capital inflows are used as stabilization tools, or "leaning against the wind."

Hypothesis 2: Capital controls and macroprudential policies are adjusted due to fear of appreciation (Calvo and Reinhart, 2002) and changing financial conditions. With capital inflows comes an upward pressure on the exchange value of the currency, which makes domestic firms less competitive in global markets. As discussed by Magud et al. (2011), a desire to stem such an appreciation results in tightening of capital controls on inflows or easing of capital controls on outflows. Additionally, when financial conditions are worsening (in this study, measured as an increase in financial conditions indicator), obtaining internal and external financing for firms and households becomes difficult due to banking distress and/or downturn in securities or foreign exchange markets (Cardarelli et al., 2011). Therefore, policymakers might be willing to ease CFM measures in order to facilitate lending and borrowing (Fratzscher, 2012).

Hypothesis 3: CFM measures are changed throughout local cycles, global cycles, or both. While there is no clear guidance on this Hypothesis from the theoretical perspective, all of the empirical studies discussed above relate CFM policies to local cyclical variables. On the one hand, financial and economic stability is the main priority for policymakers and, therefore, they should be guided by local economic and financial developments. On the other hand, policymakers might be willing to closely follow global economic and financial variables due to the presence of a global financial cycle in capital flows, asset prices, and credit growth (Rey, 2015). This is particularly the case for the EMEs as their markets are more sensitive to the global cycle due to their dependence on capital inflows.

1.3 Data and summary statistics

The cyclicality of capital controls[1] and macroprudential policies is assessed in a sample of 24 emerging market economies as presented in Appendix 1.B. The sample period spans from 1997 to 2014 for capital controls (based on the availability of extended AREAER reports) and from 2000 to 2014 for macroprudential policies. The use of quarterly as compared to annual data is beneficial as, in practice, policies are often adopted and adjusted at a high frequency in order to counteract movements in exchange rates or moderate highly volatile financial indicators. Therefore, annual data might provide a muted picture. At the same time, use of high frequency data is complicated as most macroeconomic variables are not available at a monthly or daily frequency.

Data on capital controls and macroprudential policies. Capital flow management measures include capital controls and macroprudential policies. While capital controls are defined as restrictions on cross-border financial activities that discriminate based on the residency of transactors, macroprudential policies are aimed to regulate the domestic banking sector and do not directly target capital flows.

In this paper, I use information on easing and tightening of 5 types of macroprudential policy instruments obtained from Cerutti et al. (2017b); for capital controls, a novel dataset on adjustment of capital controls on inflows and outflows for 5 types of assets is constructed. Both datasets include information on the number of tightening and easing steps undertaken by regulators as well as CFM policies direction (or *CFM index*). First, I calculate the number of easing and tightening measures for each type of asset or macroprudential instrument implemented by each country in each quarter. "Easing" steps indicate mitigation or removal of the existing barriers and are recorded with a negative sign. "Tightening" steps mean augmentation of the existing or imposition of new regulations and are coded with a positive sign. The cumulative index is computed as a sum of the number of steps for 5 categories of assets for capital controls or 5 types of instruments for macroprudential policies. Second, I identify the direction of the policy in a given quarter that is summarized as follows:

$$CFM\_index_{i,t} = \begin{cases} -1, & \text{if } \sum steps < 0 \\ 0, & \text{if } \sum steps = 0 \\ +1, & \text{if } \sum steps > 0 \end{cases} \tag{1.1}$$

Although the intensity of restrictions is captured imperfectly by this type of coding,

[1]Detailed information on construction of the dataset is presented in Appendix 1.A. The data is available upon request.

the indexes can indicate the direction of a policy change in a given country over time. At the same time, the indexes do not contain information on the initial level of capital account openness and, therefore, are more suitable for panel studies in which the initial level of openness is captured by country fixed effects. Further, the indexes do not allow for assessing the difference in restrictiveness of the regulations across countries as policy instruments may be qualitatively and quantitatively different.

Data on macroprudential policies measure adjustment of 5 types of macroprudential instruments: capital buffers (general and sector-specific), interbank exposure limits, concentration limits, LTV ratio limits, as well as domestic and foreign currency reserve requirements. General capital requirements are based on regulatory changes introduced by Basel Accord and sector-specific capital buffers capture regulations that are aimed at curtailing growth in bank claims to specific sectors of the economy. Concentration limits prohibit large exposures to a single borrower or a group of borrowers, while interbank exposure limits bound exposures to the other banks. LTV ratio limits restrict the maximum amount that an individual or a firm can borrow against their collateral. For the observed period, macroprudential policies were mostly tightened, with 305 tightening and 162 easing episodes (Table 1.2). LTV ratios and reserve requirements on foreign and local currency have the highest number of loosening and tightening episodes. At the same time, other instruments are not changed often. For example, capital requirements and interbank exposure limits were only tightened over the observed period.

Data on capital controls presents information on tightening and easing of restrictions on capital outflows and inflows for 5 types of assets; that are, portfolio equity, portfolio debt, FDI, credit, and derivatives. Changes in policies are entered as of the implementation date. The resulting dataset includes 631 easing and 239 tightening episodes as shown in Table 1.3. As opposed to macroprudential policies, capital accounts for residents and non-residents were mostly liberalized for the observed period. As expected, rather volatile credit, debt, and equity flows have the highest number of easing and tightening episodes for both capital inflows and outflows. At the same time, changes in capital account restrictions on more stable FDI flows are not frequent. This observation is in line with a "pecking order" suggesting that capital controls are usually imposed on the assets that contribute to financial instability the most (Ostry et al., 2010).

Based on the example of China, the cumulative indexes on capital controls on inflows and outflows presented in this paper are compared to the capital account openness index by Chinn and Ito (2006) and the overall inflow and outflow restriction indexes by Fernandez et al. (2015a). As Figure 1.1 (a, b) suggests, the index by Chinn and Ito (2006) is flat indicating no changes in capital account openness. The indexes on capital controls on inflows and outflows by Fernandez et al. (2015a) exhibit almost no variation and have a

value close to one, suggesting that China had a closed capital account with almost no adjustment in restrictions during the observed period of time. My index, in contrast, captures the evolution of capital controls policies documenting an increased openness of China to inflows and outflows of capital. The index is comparable to a similar intensive measure of capital account restrictiveness by Garcia (2017), as shown in Figure 1.1 (c, d). The differences between two indexes, probably, arise due to the fact that the latter index includes information on both capital transactions and exchange arrangements, while my index only captures changes in restrictions of capital account.

The main statistics for CFM measures are reported in Table 1.4. The standard deviations for both capital controls and macroprudential policies are rather high indicating active adjustment of the policies. Next, while the theory predicts that, in order to discourage net capital inflows, policymakers should increase capital controls on inflows and ease them on outflows, the observed correlation between changes in capital controls on inflows and outflows is positive. It reveals lack of a systematic use of capital controls to limit procyclicality of net capital inflows. At the same time, correlations between changes in macroprudential policies and capital controls are close to zero, thus indicating a lack of coordination between the two types of policies.

Further, changes in capital controls and macroprudential policies exhibit some variation across time and countries. As shown in Figure 1.2, changes of capital flow management measures vary widely across the sample period. Easing of capital controls on inflows was largely implemented in 1997-2004 and around the global financial crisis. The number of easing episodes dropped significantly post-crisis. At the same time, tightening episodes of capital controls on inflows were mostly introduced pre- and post-crisis. Capital controls on outflows were liberalized during the whole period with a slight decline in the number of easing episodes after 2009. Therefore, EMEs were largely liberalizing their capital accounts pre-crisis and during the crisis even though they were undertaking measures to restrict certain types of capital inflows. For the case of macroprudential policies, loosening episodes coincide with the global financial crisis, while the wave of tightening episodes occurs thereafter. Additionally, there were important differences between countries in terms of the frequency in using CFM measures (Figure 1.3) as well as in their reliance on tightening or easing of the restrictions.

Definition of business and financial cycles. To assess the cyclicality in imposition of capital controls and macroprudential policies, I distinguish between business and financial cycles. Business and financial cycles exhibit some degree of synchronization, with the duration and amplitude of booms and busts in economic activity being affected by the strength and intensity of financial cycles (Claessens et al., 2012). In this paper, the business cycle is defined as fluctuations in economic activity that an economy, or its real

sector, experiences over the period of time. It is measured as a deviation of gross domestic product from its trend, or output gap. While there is no consensus definition of the financial cycle, broadly defined, it is characterized by fluctuations of financial variables including both quantities and prices (BIS, 2014). In this paper, I use the deviation of credit to private NFC from its trend, or credit gap, as a definition of the financial cycle. Additionally, I employ real effective exchange rates (REER) as in Magud et al. (2011) and financial conditions indicators (FCI)[2,3] to assess adjustment of CFM measures at a frequency that is higher than the frequency of business and financial cycles. Further, I distinguish between two types of cycles (Kose et al., 2003), global cycles[4] and local (or country-specific) cycles. All variables are at a quarterly frequency. Detailed definitions of the variables and data sources are presented in Appendix 1.C.

In this paper, I assume that global markets are not affected by economic and financial developments in local economies, while domestic economies follow global trends (Rey, 2015).[5] To "clean" local variables from innovations that come from global developments, I derive an orthogonal component for each local variable by regressing them on global variables and taking the residuals. Further, to eliminate country-specific trends and seasonal effects, I use HP-filtering with $\lambda = 1,600$ for quarterly data.[6] Throughout the paper, I refer to the deviation of a variable from its trend as its cyclical component.

[2]The FCIs are estimated based on a TVP-FAVAR model by Koop and Korobilis (2014). The vector of financial variables includes corporate spreads, term spreads, interbank spreads, sovereign spreads, the change in long-term interest rates, equity and house price returns, equity return volatility, the change in the market share of the financial sector, and credit growth.

[3]Similar results are produced when I use CBOE Volatility Index (VIX) which is a measure of the stock market's expectation of volatility implied by S&P500 Index options. The major advantage of FCI is that it approximates financial stance of credit, equity, debt, and housing markets, while VIX only captures stock market volatility. In addition, FCIs are available for 43 advanced and emerging economies, while VIX is a measure of the global risk.

[4]In this study, I use world GDP, world credit to private non-financial corporations (includes all BIS-reporting countries), REER of emerging market economies, and FCI in the US as global variables.

[5]It is common in the literature to assume that the global cycle is mostly driven by the developments in the US (Rey, 2015), while contributions of the other individual countries are marginal. However, due to the increasing trade and financial intergeneration of the EMEs, the role of the EMEs in shaping the global economy is growing (IMF, 2016). Further, the EMEs now account for more than 75% of global growth in output and consumption, almost double the share in 2000 (IMF, 2017a). Therefore, the assumption of independence of the global market from the developments at local markets might be changing in the future.

[6]Deseasonalization of the variables and removal of a (log-)quadratic trend as well as estimations in growth rates produce similar results. Further, HP-filtering with $\lambda = 400,000$, as suggested by BIS (2014), does not alter the results.

1.4 Cyclicality of capital flow management measures: Preliminary analysis

This Section studies whether indexes on capital controls and macroprudential policies are correlated with the variables defining global as well as local financial and business cycles, as defined in Section 1.3.

Unconditional correlations. To analyze the cyclicality of CFM measures, country-by-country unconditional correlations of CFM indexes with local and global cyclical components of GDP, credit to private NFC, REER, and FCIs are calculated. For capital controls on inflows, Figure 1.4 shows that most countries display insignificant correlations and the sign of the correlations can be positive or negative with a roughly equal probability. Similarly, capital controls on outflows (Figure 1.5) behave acyclically with regard to local and global variables. Exceptionally, there are negative correlations of capital controls on outflows with local REER and GDP gaps and positive correlations with local financial conditions, though the correlations are mostly not statistically significant. Therefore, the results suggest that capital controls on inflows and outflows are largely acyclical.

For macroprudential policies, correlations with all local variables, global credit, and EMEs REER gaps are mostly statistically insignificant and are equally likely to take positive or negative values, as shown in Figure 1.6. Remarkably, most of the correlations between macroprudential policies and a global output gap are positive and statistically significant for nine countries. Further, worsening of global financial conditions is associated with the easing of macroprudential regulations for the majority of countries in the sample. Thus, macroprudential policies show some countercyclical behavior throughout global business and financial cycles.

Additionally, I check correlations for both a one quarter and a one year lags and leads of CFM indexes with cyclical components of the explanatory variables (corresponding Figures are not reported and are available upon request) as policies either can take some time to be adjusted or are changed based on the expectations of future macroeconomic and financial developments at home and abroad. For this exercise, a similar pattern emerges for correlations with slow-moving variables, such as GDP and credit gaps. At the same time, correlations become statistically insignificant or even change signs for fast-moving variables, such as REER and FCIs.

Capital flow management measures around the global financial crisis. Further, I study behavior of CFM indexes around the global financial crisis of 2007-2009. As highlighted by Fernandez et al. (2015b), regulators are often not responsive to small and short-term movements in financial and economic variables. Therefore, unconditional

correlations might not be fully able to capture countercyclical behavior of CFM measures, as fluctuations in economic and financial activities are largely dominated by the small deviations of global and local variables from trend. At the same time, regulators might be willing to use capital controls and/or macroprudential policies once they face large and long-lived fluctuations, like those observed during the global financial crisis.

Figure 1.7 displays behavior of major economic and financial indicators as well as indexes on capital controls and macroprudential policies during the 2007-2009 period. Both local and global GDP, credit to NFC, and REER picked in 2008 and dropped dramatically thereafter. Additionally, financial markets contracted at the second and third quarters of 2008 that is displayed as a peak in financial conditions indicators. At the same time, capital controls on inflows and outflows showed almost no cyclical movement during the crisis. If at all, both of them were slightly eased at the first quarter of 2008. In addition, capital controls on outflows were liberalized before 2008. In contrast, easing of macroprudential policies coincided with worsening of global financial conditions and preceded troughs in the global and local business and financial activities. Thus, macroprudential policies displayed a clear countercyclical behavior around the period of the Great Contraction.

1.5 Capital flow management measures and fundamentals: Econometric analysis

In this Section, I test empirically whether countries adjust – ease and tighten – macroprudential policies and capital controls throughout business and financial cycles as well as due to changes in REER and financial conditions. I assume that decisions on adjustment of macroprudential policies and capital controls are taken independently, as central banks are mostly responsible for macroprudential policies, while national governments (in limited cases, central banks) decide on imposition of capital controls (IMF, 2018).

1.5.1 Methodology

The empirical approach for this paper is borrowed from monetary policy literature that estimates policy reaction functions, such as a Taylor rule. I apply this strategy to estimate policy reaction functions for capital controls and macroprudential policies. As the first step, I assume that a policymaker in country i chooses between tightening and easing of CFM measures after observing all available information $\Omega_{i,t} = (Local\_cycle_{i,t}, Global\_cycle_t, CFM\_prev_{i,t})$ at time t. To estimate the policymaker's choice, I use the following logit

model:

$$Prob(CFM\_index_{i,t} = 1|\Omega_{i,t}) = \\ \Lambda(\alpha + \beta \times Local\_cycle_{i,t} + \gamma \times Global\_cycle_t + \theta \times CFM\_prev_{i,t}) \tag{1.2}$$

where $\Lambda()$ is a logistic function;

$$CFM\_index_{i,t} = \begin{cases} 1, & \text{if policy is tightened} \\ 0, & \text{if policy is eased.} \end{cases} \tag{1.3}$$

$\{Local\_cycle_{i,t}, Global\_cycle_t\}$ are defined by cyclical components of slow-moving variables, such as GDP and credit to private NFC, and fast-moving variables, such as REER and FCIs, as specified in Section 1.3;

$CFM\_prev_{i,t}$ indicates policy direction in the previous year (Pasricha, 2017). It takes the value of 1 if the previous policy action was tightening, the value of -1 if the policy action was easing, and 0, otherwise. This variable captures cycles in policy assuming that the probability of tightening (easing) increases if the previous policy action was tightening (easing).[7]

As additional control variables, I use monetary and fiscal policy stances that take the value of 1 if the policy was tightened, -1 if the policy was eased, and 0 if there was no change in the policy (Pasricha, 2017). Fiscal policy stance is approximated by fiscal balance and monetary policy stance is defined as a change in a policy rate. Tightening of a fiscal or monetary policy results in an upward pressure on interest rates, thus making investment in the country more attractive and increasing capital inflows. Therefore, policymakers might be willing to respond by tightening CFM measures. Further, I include political risk rating from PRS Group assuming that countries with unstable political environment and weak institutions might have different motivations for implementing CFM policies.

As the second step, I estimate a multinomial logit model assuming that a policymaker chooses between $K = 3$ options, that are easing, tightening, and not changing the policy. The following model is used:

$$Prob(CFM\_index_{i,t} = k|\Omega_{i,t}) = \\ \Lambda(\alpha_i^k + \beta^k \times Local\_cycle_{i,t} + \gamma^k \times Global\_cycle_t + \theta^k \times CFM\_prev_{i,t}) \tag{1.4}$$

The probability that the policymaker at country i chooses policy option k at time t is

[7] Policy directions at the previous quarter and at the previous three years produce similar results.

given by:

$$Prob(CFM\_index_{i,t} = k|\Omega_{i,t}) = \frac{exp(\alpha_i^k + \beta^k \times \Omega_{i,t})}{\sum_{K=1}^{3} exp(\alpha_i^K + \beta^K \times \Omega_{i,t})} \tag{1.5}$$

The equation (1.4) has country-specific coefficients α_i that measure time-invariant characteristics of a country that might affect its decision on adjustment of CFM measures. Therefore, regression coefficients are driven by the variation over time within each country. The models are estimated by maximum likelihood assuming independence of irrelevant alternatives (based on Hausman-McFadden test).[8]

It is worth mentioning that coefficients on local business and financial variables can suffer from a reverse causality problem; that is, capital controls and macroprudential policies that are successfully implemented can moderate local business and financial cycles (Forbes et al. (2015), Klein (2012), Ostry et al. (2010), among others). Therefore, the coefficients on local variables might be biased downwards. As in the existing literature (Klein, 2012; Cerutti et al., 2017a), I assume that the effect from policies takes place with a lag and the direction of a cycle is not changed as a result of the policy implementation. Still, the coefficients on the variables defining local cycles should be interpreted with caution.

1.5.2 Empirical results

In this Subsection, I discuss empirical results that assess motivation for adjustment of macroprudential policies as well as capital controls on inflows and outflows based on the logit and multinomial logit models presented in Subsection 1.5.1.

Logit model. The results for the baseline logit models that explain adjustment of CFM measures throughout global as well as local business and financial cycles are presented in Tables 1.5 - 1.7. Due to concerns about a high correlation between the explanatory variables, I estimate the regressions with global and local GDP, credit to NFC, REER, and FCI gaps separately in columns (1) - (8) and then all together including additional controls in columns (9) - (11) of the respective Tables.

As shown in Table 1.5, capital controls on inflows are imposed in cycles. If the policy was tightened in a previous year, the probability that the next action will be tightening increases. Further, coefficients on local variables are not statistically significant, indicating a low or zero correlation of local economic and financial developments with index on capital controls on inflows. Unlike the existing literature (Pasricha, 2017; Fratzscher, 2012), changes in real effective exchange rates and GDP are not associated with changes

[8]The nested logit model that assumes that a policymaker, first, chooses whether to adjust a CFM policy or not and, second, selects between tightening and easing of the policy produces similar results.

in capital controls on inflows. At the same time, worsening of global financial conditions and/or a drop in credit to the NFC increase the probability of easing of the policies.

For capital controls on outflows (Table 1.6), tightening of capital restrictions in the last year increases the probability of tightening them in the current year due to the persistence of the policies. Global financial and economic variables have a low power in explaining imposition of the capital restrictions. At the same time, the probability of tightening capital controls on outflows increases in times of financial busts or when exchange rates depreciate, thus preventing domestic agents from pushing capital abroad (Aizenman and Pasricha, 2013). To the contrary, financial booms in a domestic economy increase the probability of easing capital restrictions, thus, allowing the economy or its financial sector to cool down. Statistical significance of the coefficients on local variables is, however, sensitive to the model specification.

Further, Table 1.7 reports the estimates for tightening and easing of macroprudential policies. Countries that tightened macroprudential policies over the previous year tend to tighten them in the current period indicating that CFM policy changes come in cycles. Contrary to Cerutti et al. (2017b), local variables have little or no power in explaining adjustment of macroprudential policies. At the same time, macroprudential policies are adjusted in a countercyclical manner throughout global financial cycles measured by credit to private NFC and FCIs. As a financial boom abroad is usually accompanied by surge in capital flows, tightening of macroprudential policies seems to be used to put "sand in the wheels" of international borrowing. Additionally, in times of worsening of global financial conditions, macroprudential instruments might be relaxed in order to support a vulnerable domestic financial sector and attract additional financial flows from the rest of the world. It is worth mentioning that other control variables, like monetary policy stance, fiscal policy stance, and political risk have no statistical power in explaining adjustment of macroprudential policies.

The overall results show that use of capital controls on outflows is somewhat procyclical throughout local business and financial cycles, though statistical significance of the coefficients is sensitive to the model specification. At the same time, macroprudential policies and capital controls on inflows are adjusted countercyclically throughout global financial cycle (defined as credit gap) and changing global financial conditions. The latter finding suggests that policymakers at the EMEs are closely following global developments and domestic policies are largely shaped by the global financial cycle.

Multinomial logit model. The results for a multinomial logit model that assumes that a policymaker chooses between not changing, tightening, and easing of CFM measures after observing global as well as local business and financial variables are presented in Table 1.8. Each column of the Table presents coefficients for choosing one option over

the baseline option (for example, choosing tightening over not changing, easing over not changing, or tightening over easing of a CFM measure).

As for the logit model described above, macroprudential policies and capital controls on inflows are adjusted countercyclically throughout global financial cycles, while domestic variables play a minor role and are not statistically significant. Exceptionally, the probability of easing capital controls on inflows increases when local real exchange rates depreciate as in Pasricha (2017). At the same time, the probability of tightening over not changing the policy stays unaffected along fluctuations of REER. This finding might be explained by foreign currency debt accumulation at the EMEs and a subsequent fear of depreciation rather than appreciation (Levy-Yeyati and Rey, 2006). In addition, adjustment of capital controls on outflows is motivated by changing local REER, GDP, and financial conditions as in a simple logit model.

To give a more in depth explanation for the results, the average predicted probabilities from multinomial logit models are computed as follows:

$$\frac{\partial Prob_{i,k,t}}{\partial \Omega_{i,t}} = Prob_{i,k,t}(\beta^k - \sum_{K=1}^{3} Prob_{i,K,t} \times \beta^K) \tag{1.6}$$

where i is a country and $k = \{No\ change, Tightening, Easing\}$. The predicted probability of choosing easing, tightening, or not changing the policy by country i are computed at different values of the continuous predictor variables, holding all other variables at their current values. Then probabilities are averaged across countries.

Figure 1.8 shows average predicted probabilities of changes in CFM measures at different values of global variables. While the probabilities of tightening and easing of capital controls on outflows are close to zero and remain almost unchanged throughout global business and financial cycles, capital controls on inflows behave somewhat countercyclically (that is, the probability of tightening them in times of a global financial boom increases to about 10%). Additionally, the probability of tightening macroprudential policies increases in times of booms in global business and financial activities. For example, the probability of tightening is around 30% at the peaks of global business and financial cycles. The probability of easing macroprudential policies changes with changing global economic and financial conditions; that is, at the peak of the global FCI, i.e. financial conditions are the worst, and at the trough in global GDP the probability of easing macroprudential policies increases to more than 60% and 20%, respectively.

Next, Figure 1.9 displays average predicted probabilities of adjustment of CFM measures throughout local business and financial cycles. While the probabilities of policy changes remain almost unchanged for different values of local GDP, credit to private NFC, and REER, some changes in the use of capital controls and macroprudential policies

along different local financial conditions are observed. The probability of easing capital controls on outflows increases from zero to almost 20% and the probability of tightening to 15% at the time of good and bad local financial conditions, respectively. The small probabilities for tightening and easing of capital controls on outflows are not surprising as change of these policies is a rare event and it is observed only in about 10% of the sample. Additionally, the probability of easing macroprudential policies and capital controls on inflows rises to about 20% in times of unfavorable local financial conditions, while the probability of their tightening remains almost constant throughout the cycle.

1.5.3 Robustness checks and extensions

In this Subsection, I provide robustness checks (the corresponding regression results are not reported and are available upon request) as well as some extensions of the analysis.

Robustness of the results. For robustness of the results, I check whether the main conclusions hold when I use one-quarter and one-year lags as well as four-quarters cumulative explanatory variables. The intuition is that a policymaker makes a decision on adjustment of CFM measures based on financial and business variables observed in the past. The regression results, however, become weaker in terms of statistical significance when I use one-quarter lags or four-quarters cumulative explanatory variables and statistically insignificant or with a different sign for one-year lagged explanatory variables. It suggests that, for the given sample of countries, policymakers base their decisions on the current state of the economy and financial markets. The results, however, are not driven by a single country or a single explanatory variable and they become stronger in terms of a statistical significance when I estimate the regressions on a reduced sample of countries that actively adjusted CFM measures as defined in the Appendix 1.B. In addition, the results are mostly driven by the period around and after the global financial crisis, when the paradigm shift occurred and policymakers started using capital flow management measures as stabilization tools more frequently.

Disaggregation by asset category and macroprudential instrument. As an extension of the main results, I analyze the cyclicality of capital controls for each category of assets and of macroprudential policies for each prudential instrument (Table 1.9). For capital controls on inflows and outflows, I estimate the regressions using changes in controls on non-FDI, credit, equity, and debt flows as dependent variables. The results are mostly driven by restrictions on credit inflows that are introduced countercyclically. Additionally, worsening financial conditions coincide with easing of capital controls on all types of inflows. These findings support the idea that EMEs are heavily dependent on global capital inflows. Therefore, in times of a global financial bust, capital restrictions

are alleviated in order to attract additional financing from abroad, mostly in the form of credits. For capital controls on outflows, the coefficients for all asset types have the right sign, but are not statistically significant. It might be due to a small number of observations in each category of assets.

For macroprudential policies, I run regressions using adjustment of financial institution-targeted instruments (all instruments, excluding LTV ratios as in Cerutti et al. (2017b)), LTV ratios, and reserve requirements on local and foreign currency-denominated accounts as dependent variables. I do not run separate regressions for capital buffers, concentration limits, and interbank exposure limits due to a small number of tightening and easing episodes.[9] The results obtained for a cumulative index are mostly driven by local reserve requirements that are introduced countercyclically throughout global business and financial cycles. Additionally, the probability of easing foreign reserve requirements and LTV ratios increases in times of worsening global financial conditions. All in all, these results indicate the importance of analyzing capital controls and macroprudential policies separately for each type of asset and instrument as opposed to the cumulative indexes used in the existing literature.

Intensity of capital flow management measures. When changes in financial or economic fundamentals are small, policymakers might opt for not changing or moderate changes in CFM measures. At the same time, when significant swings in economic or financial variables are observed, policymakers may intensify the use of CFM policies. As the main measure of capital controls and macroprudential policies used in this paper indicates the direction of a policy – tightening or easing – it does not allow for capturing the intensity with which policies are used. To partially account for this drawback, Table 1.10 presents the results for an ordered logit model, as in Pasricha (2017), that uses the number of easing and tightening steps made by each country in each quarter as a dependent variable. It is worth mentioning, however, that intensity is not captured precisely by this type of measurement, as the country that undertakes many small tightening or easing steps will be classified as the one that uses CFM policies more intensively as compared to the country that undertakes one significant change in a CFM measure. Overall, the results are in line with the previous models suggesting that adjustment of macroprudential policies and capital controls on inflows is motivated by global developments, while capital controls on outflows are imposed somewhat procyclically throughout local business and

[9] In addition, I disaggregate macroprudential instruments into capital tools (interbank exposure limits and capital buffers), assets-side tools (LTV ratios and concentration limits), and liquidity-related tools (reserve requirements on local and foreign currency-denominated accounts) as in IMF-FSB-BIS (2016). The results (not reported) suggest that liquidity-related tools are adjusted in a countercyclical way throughout global business and financial cycles. However, there is no clear countercyclical pattern in changes of asset-side and capital tools.

financial cycles. Additionally, both capital controls on inflows and outflows are statistically significantly correlated with fluctuations in local REER.

Disaggregation by income level, external indebtedness, exchange-rate regime, and other characteristics. As countries are heterogeneous along a number of dimensions, I investigate whether incentives to change CFM measures vary across countries with different income level, external indebtedness, exchange rates (ER) regime, quality of institutions, and amount of FX reserves (Table 1.11). First, I examine how CFM measures are adjusted by countries with different income levels. For that, I divide countries into high-, medium-, and low-income based on the World Bank (WB) income group classification.[10] High-income economies are usually much less volatile as compared to medium- and low-income countries. As noted by Fernandez et al. (2015b), volatile economies should benefit more from imposition of countercyclical CFM measures. The results suggest that high-income countries use capital controls on inflows in a countercyclical manner, while medium- and low-income economies seem to rely more on macroprudential policies and capital controls on outflows. These observations are, however, not fully attributed to the difference in quality of institutions that is defined as a regulatory quality based on the WB Worldwide Governance Indicators.[11]

Second, I check whether the cyclicality of changes in CFM measures varies with country's external indebtedness that is defined as a net foreign assets-to-GDP ratio from Lane and Milesi-Ferretti (2007). I distinguish between countries with high, medium, and low external debt.[12] Countries with high external debt are usually more volatile and are characterized by more pronounced booms and busts. Therefore, highly-indebted countries should be more likely to apply CFM measures to mild business and financial cycles (Fernandez et al., 2015b). Indeed, countries with medium and high debt seem to adjust macroprudential polices and capital controls on net inflows in a countercyclical way, while adjustment of CFM measures by countries with a low external debt is acyclical.

Next, I divide countries based on their exchange rate arrangements, as defined by Ilzetzki et al. (2017). I distinguish between countries with fixed (classified as fixed or crawling peg) and floating (classified as floating or managed floating) ER regimes. As the theory states, countercyclical use of CFM measures is more beneficial under fixed exchange

[10]Low-income countries: India, Indonesia, and the Philippines; medium-income countries: Argentina, Brazil, Bulgaria, China, Colombia, Hungary, Malaysia, Mexico, Peru, Romania, Thailand, South Africa, and Turkey; high-income countries: Chile, Czech Republic, Israel, Korea, Slovak Republic, Slovenia, Russia, and Poland.

[11]A country is considered to have low quality of institutions if estimates of regulatory quality from the WB Worldwide Governance Indicators are below zero, and good quality of institutions if the estimates are above zero.

[12]A country is considered to be highly-indebted if it belongs to a lower quartile and low-indebted if it is in an upper quartile of the external indebtedness distribution.

rate regimes because these policies can potentially reduce the amplitude of expansions and contractions in aggregate demand (Schmitt-Grohé and Uribe, 2016). Yet, the results suggest that countries with different ER regimes do not show a clear-cut difference in adjustment of CFM policies at different points of cycles, as measured by credit and GDP gaps. At the same time, indexes on macroprudential policies are statistically significantly correlated with global and local financial conditions indicators for economies with a fixed ER regime. Further, under a floating exchange rate regime adjustment of capital controls on outflows and macroprudential polices is associated with changes in local REER.

Finally, I distinguish between countries with different amount of FX reserves-to-GDP ratios, as defined by Lane and Milesi-Ferretti (2007).[13] As noted by Aizenman et al. (2013), the "trilemma" variables in EMEs have converged towards intermediate levels. It was possible due to a significant accumulation of international reserves that were used as a buffer. I observe that countries that have not accumulated substantial amount of FX reserves were adjusting macroprudential policies and capital controls on net inflows in a countercyclical manner. At the same time, countries with high FX reserves-to-GDP ratios changed CFM measures only along changing global and local financial conditions.

1.6 Conclusion and outlook

A growing theoretical literature and international policymakers argue that macroprudential policies and capital controls on net capital inflows should "put sand in the wheels" of international borrowing by being tightened during booms and relaxed during busts in economic and/or financial activities. In this paper, I show that macroprudential policies and capital controls on inflows are adjusted in a countercyclical manner throughout the global financial cycle, and especially changing global financial conditions. At the same time, capital controls on outflows respond somewhat procyclically to local developments.

In this paper, I present a novel dataset on easing and tightening of capital controls on inflows and outflows for 5 types of assets for 24 emerging economies for the 1997-2014 period at a quarterly frequency. Using this dataset together with a dataset on changes in macroprudential policies by Cerutti et al. (2017b), I analyze patterns of a co-movement of CFM measures with different macroeconomic and financial variables using correlation analysis, inference around the global financial crisis, and regression analysis. I distinguish between global as well as local business and financial cycles that are proxied by slow-moving variables, such as GDP and credit to private NFC, and fast-moving variables,

[13] I distinguish between countries with high, medium, and low FX reserves. A country has high FX reserves-to-GDP if it belongs to an upper quartile and low FX reserves-to-GDP if it is in a lower quartile of the distribution of FX reserves-to-GDP ratios.

such as real effective exchange rates and financial conditions indicators.

The main findings of this paper indicate that policymakers in EMEs use capital controls on outflows in a somewhat procyclical fashion throughout local cycles, but statistical significance of the coefficients is sensitive to the model specification. At the same time, macroprudential policies and capital controls on inflows are adjusted in a countercyclical manner throughout global financial cycles. These findings suggest that Hypotheses 1-3 are supported depending on the type of policy instruments being used. More specifically, worsening of global financial conditions and/or slowing down of a global credit growth increases the probability of easing restrictions on capital inflows and macroprudential policies, thus allowing to attract additional financing from abroad and facilitating consumption and investment. The opposite happens in times of a global financial boom as policymakers might want to limit international borrowing and, thus, prevent overheating of the economy. For capital controls on outflows, global financial and economic variables have a low power in explaining their adjustment. At the same time, restrictions on capital outflows are adjusted somewhat procyclically throughout local business and financial cycles as well as along changes in local REER. For example, the probability of tightening capital controls on outflows increases in times of economic or financial busts, thus preventing domestic agents from pushing capital abroad.

The findings differ across the macroprudential instruments: local and foreign reserve requirements as well as LTV ratios behave countercyclically, while the other instruments are imposed with more structural objectives (address long-term aspects of the economy as opposed to short-term recession-fighting measures) in mind. Capital controls on credit inflows exhibit a clear countercyclical behavior, while restrictions on the other capital inflows are only correlated with global financial conditions. In addition, there is some heterogeneity in adjustment of CFM measures by countries with different characteristics. Countries disaggregated based on their income level, external indebtedness, and ER regimes differ in application of instruments, macroprudential policies *versus* capital controls, and strategies, countercyclical *versus* acyclical use of CFM policies.

As the view with respect to the use of capital controls and macroprudential policies as "the second best tool" was accepted only around the global financial crisis, it will be interesting to update the index constructed for this paper to determine whether the observed pattern on (counter-)cyclicality of CFM measures changes over time. Further, the index can be useful for assessing effectiveness of CFM measures (Ostry et al., 2010; Klein, 2012; Forbes et al., 2015) around the global financial crisis and thereafter. A more granular analysis on the stabilizing effect of CFM measures can be performed as the index provides information on tightening and easing of policies as well as distinguishes between restrictions on different types of assets and macroprudential instruments.

Appendix

1.A Description of a dataset on capital controls

The dataset provides information on tightening and easing of capital controls on inflows and outflows for 5 types of assets for the 1997-2014 period at a quarterly frequency. The primary source of information for the dataset is the AREAER by the International Monetary Fund for the 1997-2014 period. I focus on the end of the section for each country that reports changes in capital flow management policies that occurred over the year. Additionally, I supplement the AREAER with the information from the papers by Ahmed et al. (2015), Chantapacdepong and Shim (2015), and Pasricha et al. (2017).

For this dataset, "Easing" indicates mitigation or removal of the existing barriers and it is entered with a negative sign. "Tightening" means augmentation of the existing or imposition of new regulations and it is coded with a positive sign. To construct the data, first, I calculate the number of steps (actions) made by regulators for each category of assets in each quarter. Second, I identify the direction of the policy: if the total number of steps is a negative number, the policy is eased; and if it is positive, the policy is tightened. The index is coded as 0 if either no changes of policies occur or the number of tightening and easing actions is equal.

The dataset provides information on adjustment of capital controls on inflows and outflows for 5 types of assets that correspond to the types of transactions at the balance of payment (BoP) disaggregated as follows:

- "Debt" includes information on capital controls on portfolio investment in debt instruments; that is, money market instruments and bonds (Debt securities in the BoP);
- "Equity" provides information on capital controls of individual companies ("equities") or of mutual funds or other investment trusts ("collective investments") (Equity securities in the BoP);
- "Derivatives" include information on controls on derivatives and other instruments (Financial derivatives in the BoP);
- "Credits" inform on capital controls on financial credits, commercial credits, and guarantees and sureties (Other investment in the BoP);
- "FDI" refers to the controls on investments that involve active participation in the management of the acquired entities (Direct investment in the BoP).

Further, I distinguish between capital controls on inflows and outflows following Fernandez et al. (2015a). For three types of assets, that are debt, equity, and derivatives, capital controls on inflows include controls on the purchase of assets locally by non-residents and the sale or issue of assets abroad by residents. Capital controls on outflows refer to controls on the purchase of assets abroad by residents and the sale or issue of assets locally by non-residents. For credit operations and direct investment, there are capital controls on inflows and outflows without further disaggregation.

Examples of the measures that are considered to be capital controls are:

- Change in limits on the amount of loans in FX or the allowed amount of cross-border flows;
- Change in tax rates or non-remunerated reserve requirements;
- Change in minimum stay requirements;
- Change in a permitted maturity of an asset;
- Permission or prohibition to purchase/sale/issue some instruments freely within specific group of countries, under certain conditions, or in a specific currency;
- Easing or tightening of a transaction for a specific agent (banks or mutual funds); and
- Change of conditions on the use of proceeds.

Measures that are NOT considered to be capital controls:

- Changes in macroprudential regulations that do not discriminate on residency;
- Limits on capital flows that target a specific country, a specific industry (with an exception of a financial sector and pension funds), and/or are imposed on government transactions (defense, security, etc.). If a control refers to more than one sector where private entrepreneurship is common, then it is categorized as a control;
- Capital controls related to sanctions for political reasons;
- Changes in rules related to foreign purchases of land;
- Authorization, approval, permission, and clearance are considered to be capital controls, while reporting, registration, notification, and declaration are not reported as capital controls (Fernandez et al., 2015a); and
- Capital controls imposed on FDI flows that concern only natural persons.

1.B List of countries

Baseline sample (24 emerging market economies):
Argentina, Brazil, Bulgaria, Chile, China, Colombia, Czech Republic, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Peru, the Philippines, Poland, Romania, Russia, Slovak Republic, Slovenia, South Africa, Thailand, and Turkey.

Reduced sample:
Argentina (from 2004), Brazil, Chile, China, Colombia, India, Indonesia, Israel, Korea, Malaysia, Mexico, Peru, the Philippines, South Africa, Thailand, Russia (from 2002), and Turkey (from 2004).

1.C Data sources

Table 1.1: Definitions of variables and data sources

Variable	Description	Source
	Dependent variables:	
Index on capital controls on inflows and capital controls on outflows	Index indicating the direction of a policy change. It takes the value +1 if the policy is tightened, -1 if the it is eased, and 0 otherwise	Author's calculations, IMF AREAER
Index on macroprudential policies		Cerutti et al. (2017b)
Capital controls on inflows (steps) and outflows (steps)	The number of tightening (+) and easing (-) steps undertaken by regulators	Author's calculations, IMF AREAER
Macroprudential policies (steps)		Cerutti et al. (2017b)
	Explanatory variables:	
GDP	Nominal GDP, bln. USD	Haver Analytics
Credit	Credit to non-financial private sector from all sectors at a market value, bln. USD	BIS
Real effective exchange rate	Real effective exchange rate, CPI based, 2010=100 (increase = appreciation)	Haver Analytics
Financial conditions indicator	The indicator approximates financial stance of credit, equity, debt, and housing markets (higher value = higher risk)	IMF (2017b)
	Additional controls:	
CFM policies (prev. years)	An indicator variable that takes the value +1 if a CFM policy was tightened in the previous year, -1 if it was eased, and 0 otherwise	Author's calculations
Monetary policy stance	An indicator variable that takes the value +1 if monetary policy was tightened, -1 if it was eased, and 0 otherwise. Monetary policy is approximated by changes in a policy rate	IMF International Financial Statistics
Fiscal policy stance	An indicator variable that takes the value +1 if fiscal policy was tightened, -1 if it was eased, and 0 otherwise. Fiscal policy is defined as a fiscal balance, bln. USD	Haver Analytics
Political risk taking	Risk index assessing the political stability of a country (high points = low risk)	PRS Group

*N*ote: The cyclical components of all explanatory variables are computed using the HP-filter as discussed in Section 1.3. Credit: for Bulgaria, Peru, the Philippines, Romania, Slovakia, and Slovenia, I use claims on private sector by other deposit taking corporations from the IMF IFS. Financial conditions indicator: for Romania, Slovakia, and Slovenia, I use financial stability indicators from Cardarelli et al. (2011).

1.D Figures

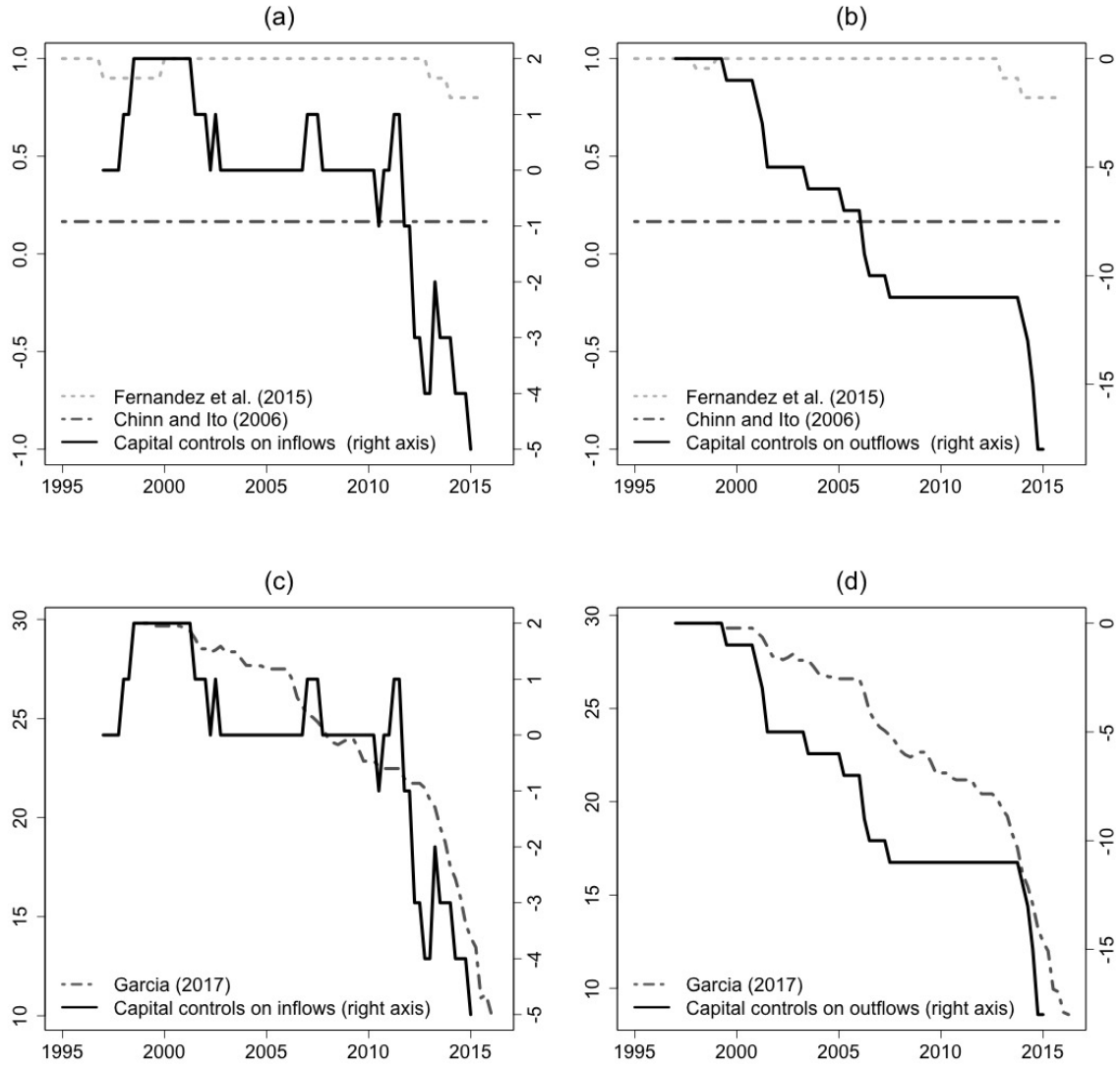

Figure 1.1: Comparison of indexes on capital controls on inflows (a, c) and capital controls on outflows (b, d) with the other indexes on capital account restrictions for the case of China. *Note*: Indexes on capital controls on inflows and outflows (black solid lines) are the cumulative number of easing and tightening steps undertaken by regulators as of the first quarter of 1997.

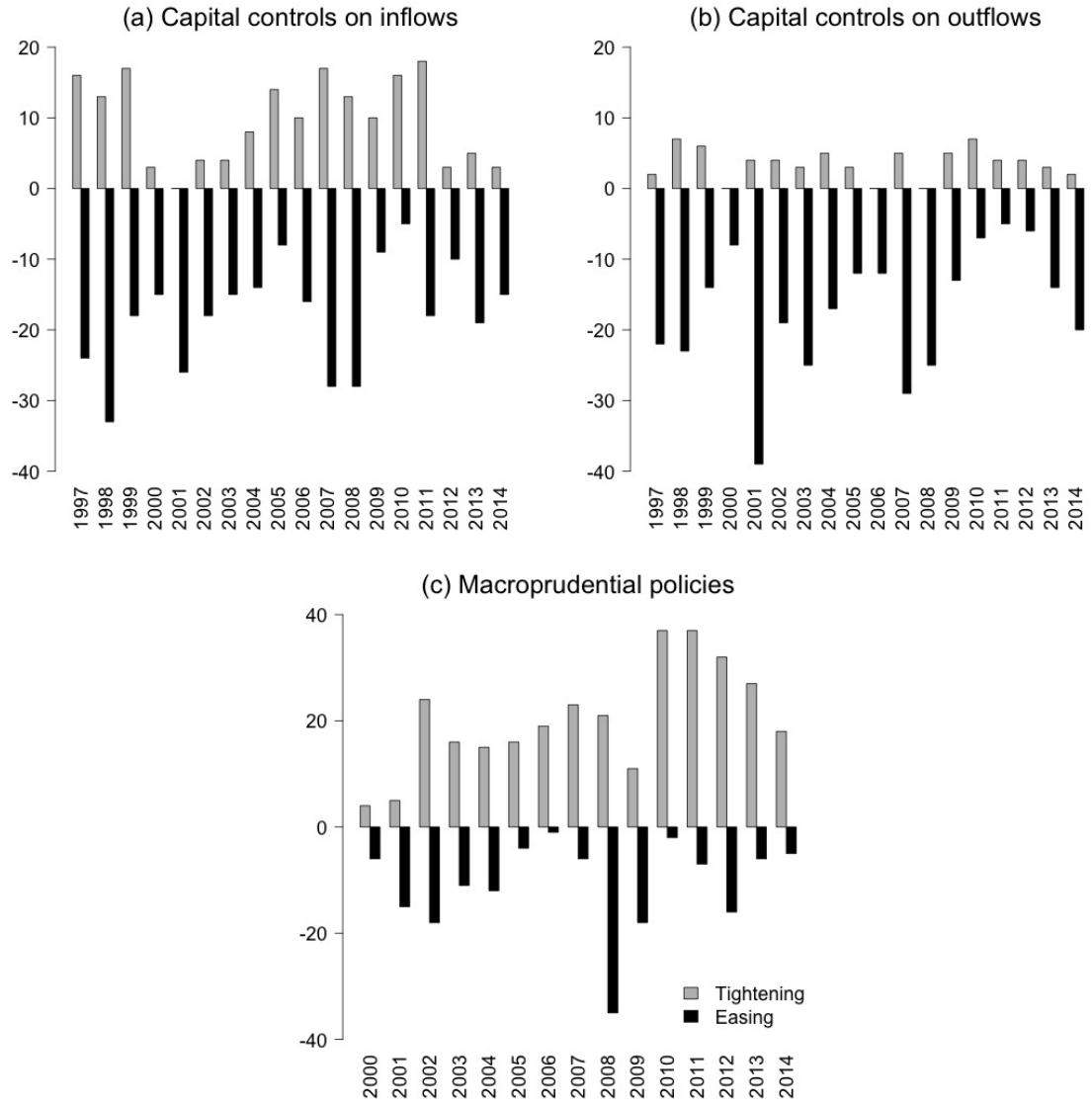

Figure 1.2: Capital flow management measures across time. *Note*: Each bar indicates the number of tightening and easing steps made by all countries in the sample in a given year.

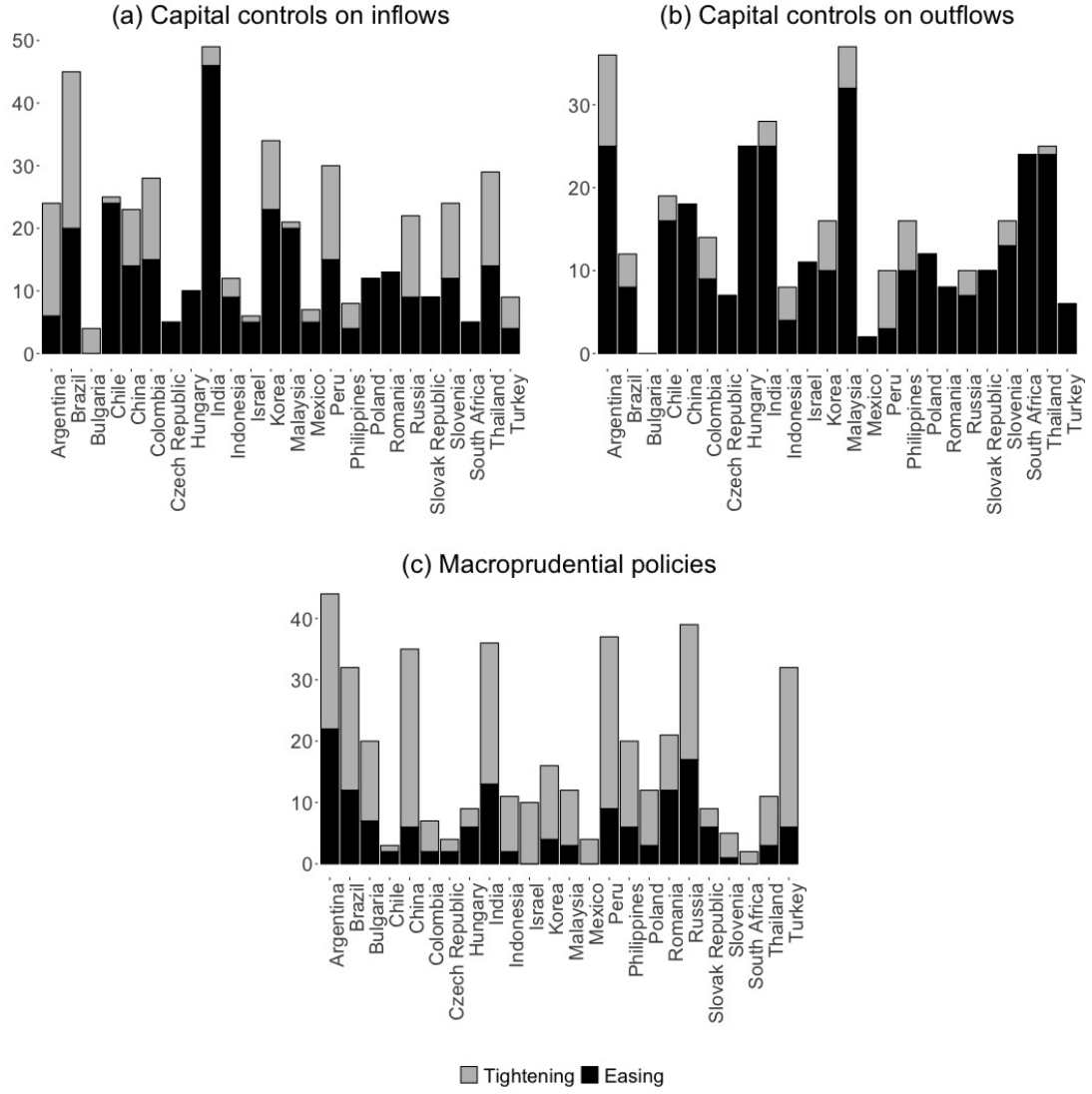

Figure 1.3: Capital flow management measures across countries. *N*ote: Each bar indicates the number of tightening and easing steps made by a country over the 1997-2014 period for capital controls and 2000-2014 period for macroprudential policies.

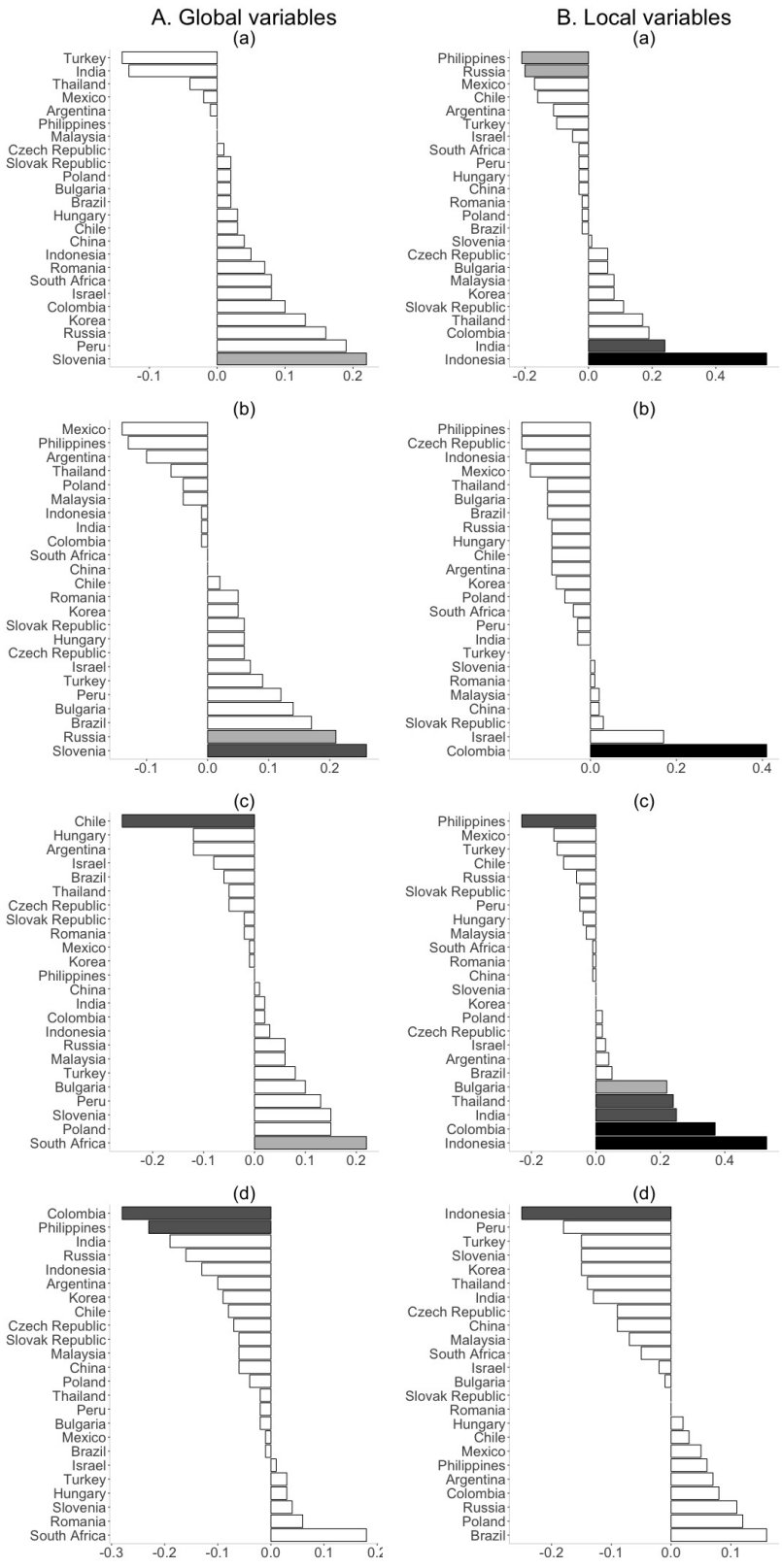

Figure 1.4: Country-by-country correlations between index on capital controls on inflows and (a) GDP gap; (b) credit gap; (c) REER gap; and (d) FCI gap. *Note*: Correlations are computed using CFM indexes and cyclical components of the corresponding time series. Black, dark grey, and light grey bars indicate statistical significance at 1, 5, and 10 percent levels respectively. Missing bars indicate covariances equal to zero.

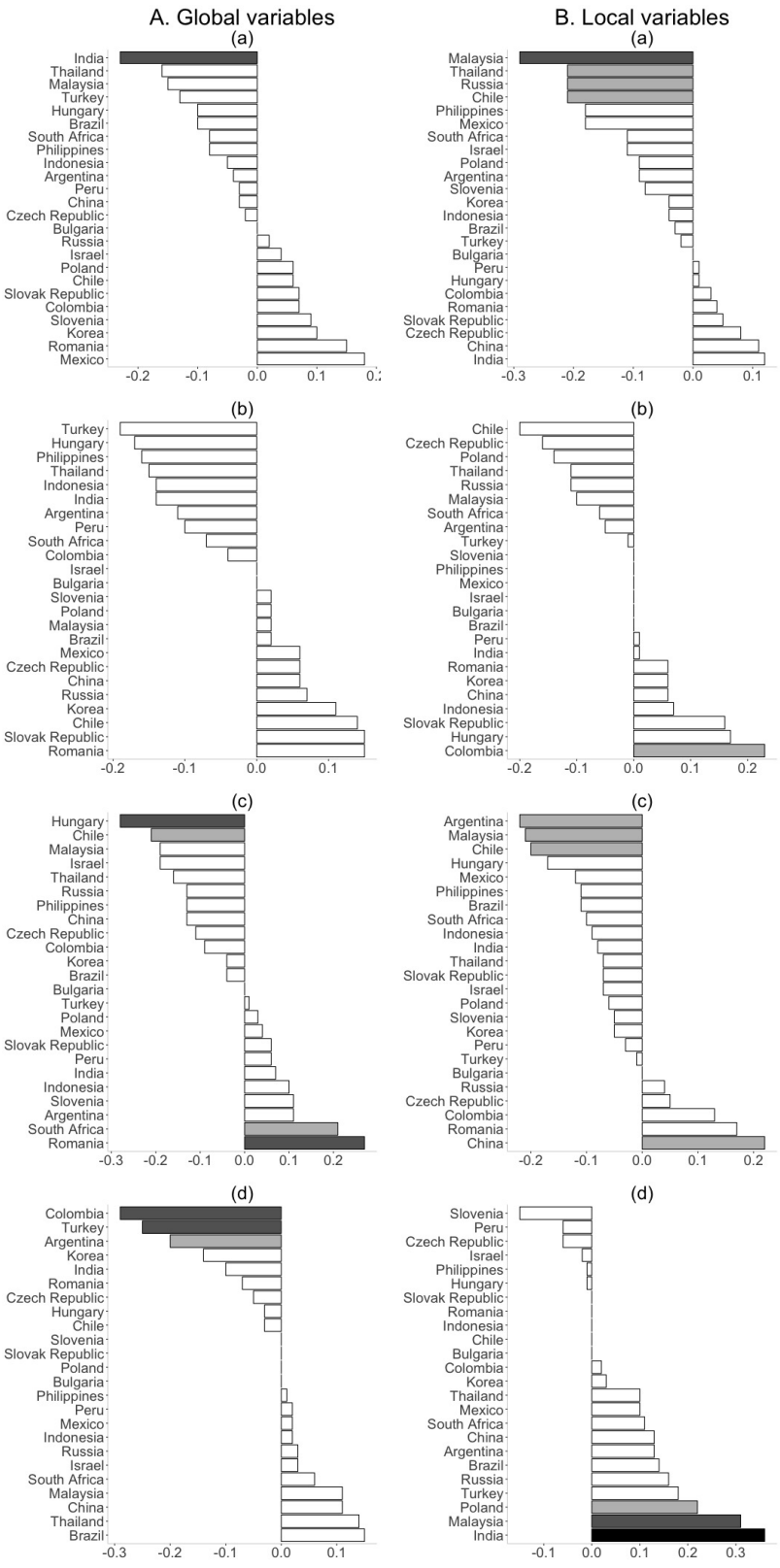

Figure 1.5: Country-by-country correlations between index on capital controls on outflows and (a) GDP gap; (b) credit gap; (c) REER gap; and (d) FCI gap. *Note*: Correlations are computed using CFM indexes and cyclical components of the corresponding time series. Black, dark grey, and light grey bars indicate statistical significance at 1, 5, and 10 percent levels respectively. Missing bars indicate covariances equal to zero.

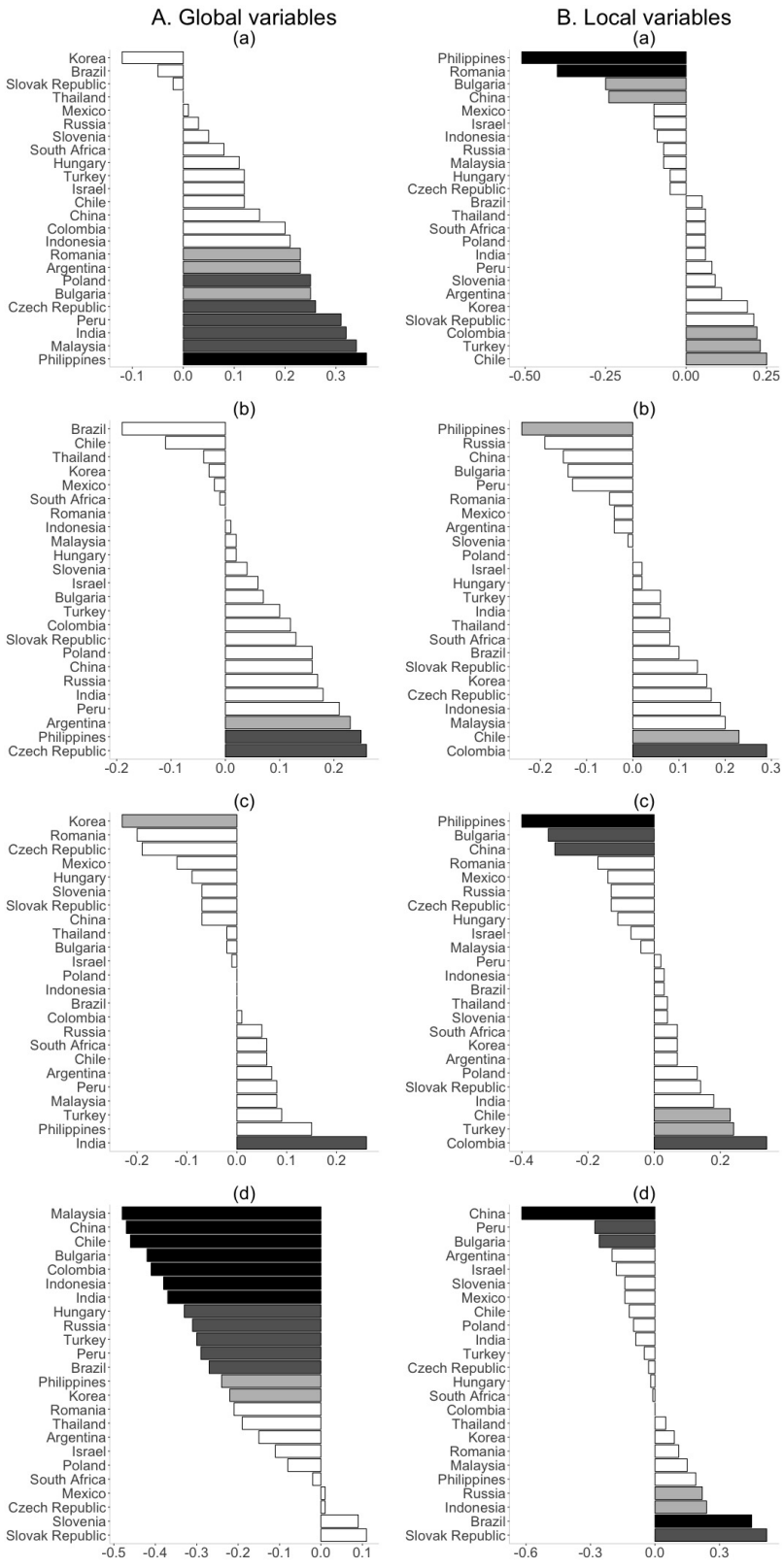

Figure 1.6: Country-by-country correlations between index on macroprudential policies and (a) GDP gap; (b) credit gap; (c) REER gap; and (d) FCI gap. *Note*: Correlations are computed using CFM indexes and cyclical components of the corresponding time series. Black, dark grey, and light grey bars indicate statistical significance at 1, 5, and 10 percent levels respectively. Missing bars indicate covariances equal to zero.

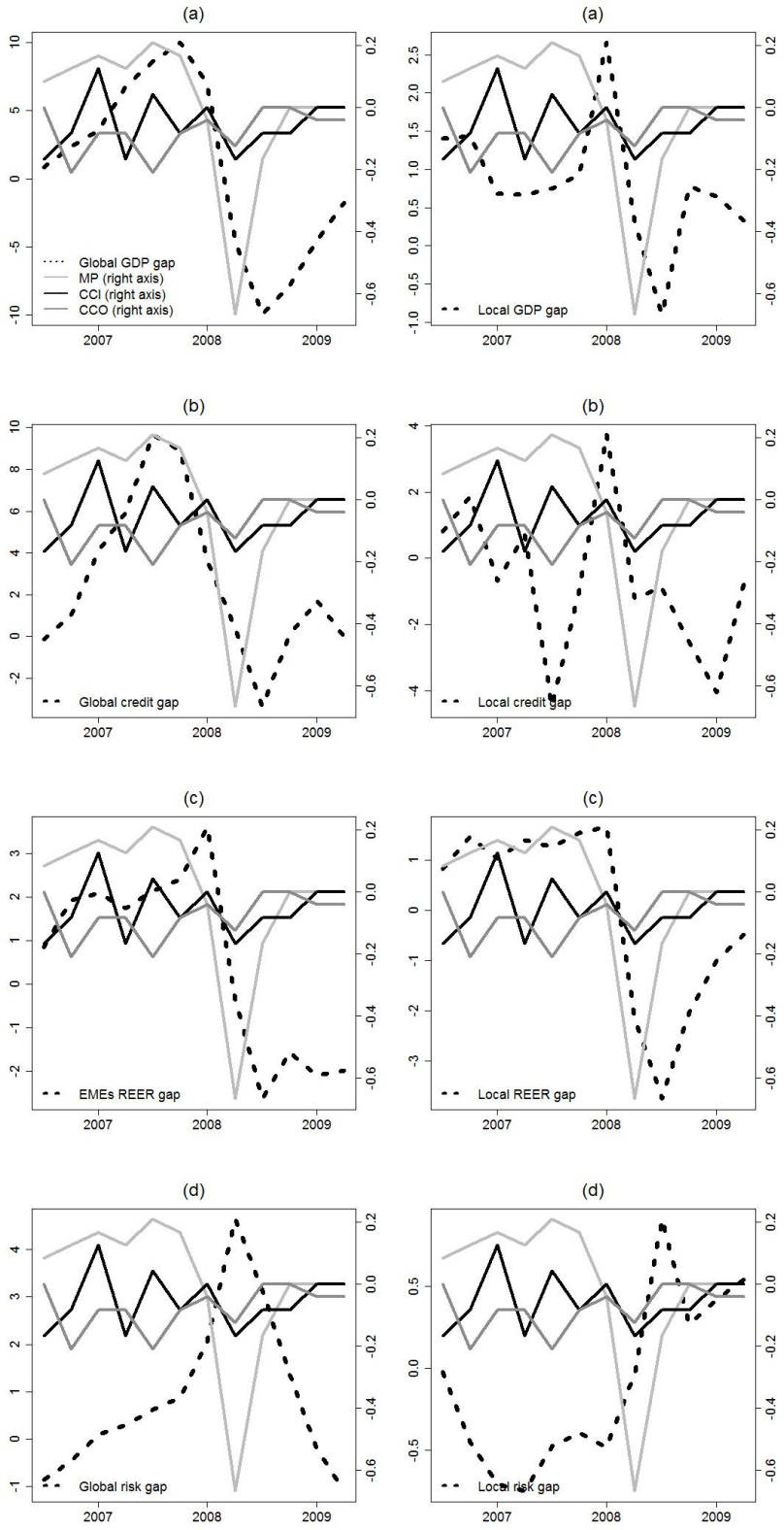

Figure 1.7: CFM measures during the global financial crisis of 2007-2009. *N*ote: The Figure displays a co-movement between global and local economic and financial variables (dashed lines, black) and indexes on CFM measures (solid lines) over the period 2007-2009. The local economic and financial variables as well as indexes on CFM measures are averaged across countries.

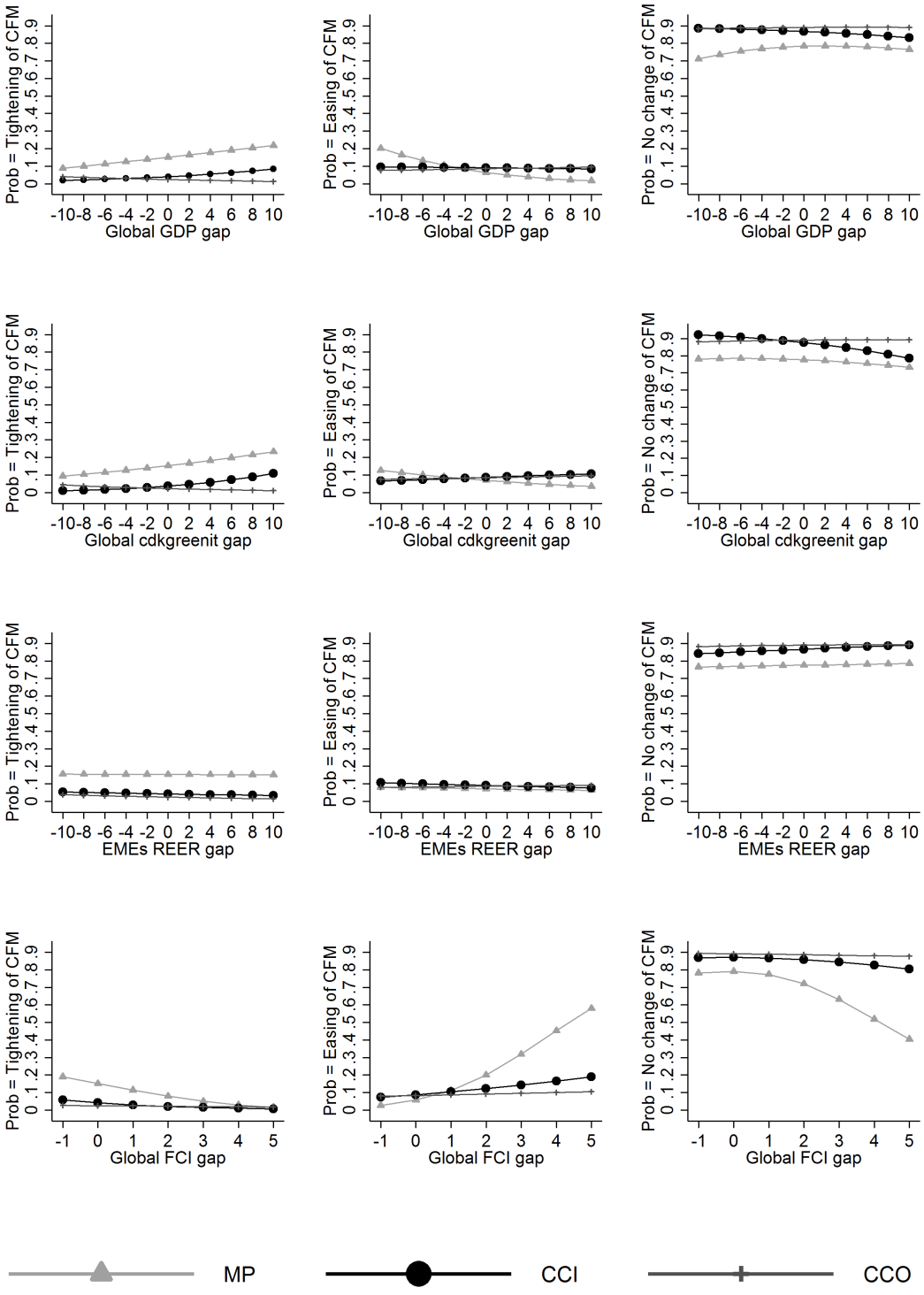

Figure 1.8: Average predicted probabilities of tightening (right column), easing (middle column), and not changing (left column) CFM measures throughout global business and financial cycles. *Note*: X-axis displays gaps in global variables and y-axis displays probabilities of tightening, easing, and not changing the policies.

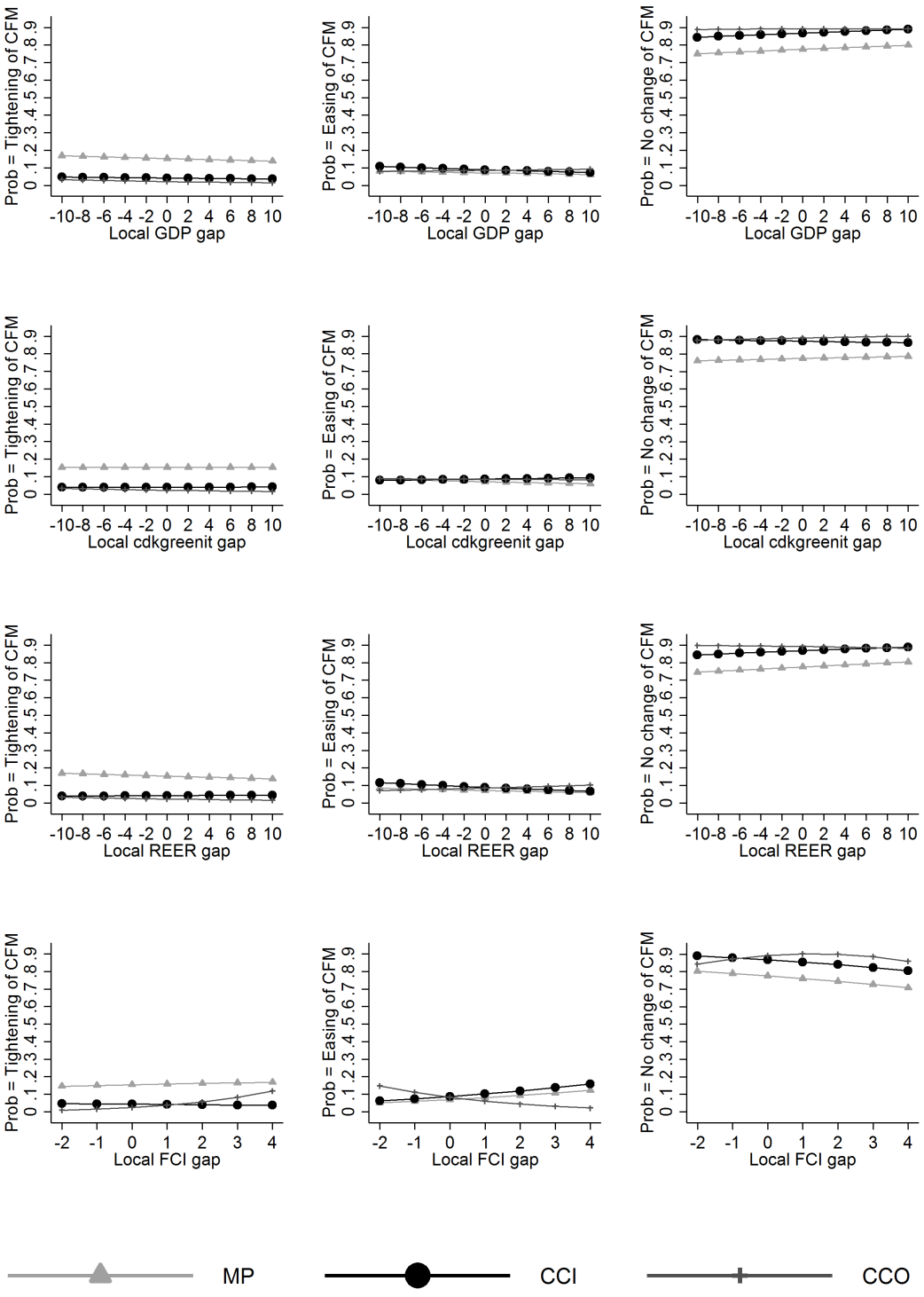

Figure 1.9: Average predicted probabilities of tightening (right column), easing (middle column), and not changing (left column) CFM measures throughout local business and financial cycles. *Note*: X-axis displays gaps in local variables and y-axis displays probabilities of tightening, easing, and not changing the policies.

1.E Tables[14]

Table 1.2: Macroprudential policies (MP): easing vs. tightening steps

	Tightening	Easing
Sector-specific capital buffers	42	12
Capital requirements	39	0
Concentration limit	14	2
Interbank exposure limit	9	0
LTV capital ratio	34	10
RR foreign	65	42
RR local	102	96
Total	305	162

Note: This Table shows the number of tightening and easing steps for different macroprudential instruments made by all countries in the sample for the 2000-2014 period.

Table 1.3: Capital controls (CC): easing vs. tightening steps

	CC on outflows		CC on inflows	
	Tightening	Easing	Tightening	Easing
Equity	14	79	23	59
Debt	14	71	33	50
Credits	23	65	85	110
FDI	3	47	8	37
Derivatives	10	50	26	63
Total	64	312	175	319

Note: This Table shows the number of tightening and easing steps for different categories of assets made by all countries in the sample for the 1997-2014 period.

Table 1.4: Main statistics: CFM measures

Statistics	Obs.	Mean	SD	Min	Max	$\rho_{i,CCI}$	$\rho_{i,MP}$
MP index	1,440	0.075	0.458	−1	1	0.140	1.000
CCI index	1,752	−0.049	0.368	−1	1	1.000	0.140
CCO index	1,752	−0.066	0.327	−1	1	0.348	0.027
MP steps	1,440	0.099	0.744	−6	10	0.192	1.000
CCI steps	1,752	−0.082	0.868	−10	10	1.000	0.192
CCO steps	1,752	−0.142	0.789	−9	4	0.384	0.027

Note: The sample covers the 1997-2014 period for capital controls and 2000-2014 period for macroprudential policies. CCI = capital controls on inflows, CCO = capital controls on outflows.

[14]Tables are produced using R package *stargazer* (Hlavac, 2018).

Table 1.5: Regression results – Capital controls on inflows

	Dependent variable:										
	Index on capital controls on inflows: 1 - tightening, 0 - easing										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Local GDP gap	−0.001	−0.002							−0.080*		−0.107**
	(0.014)	(0.014)							(0.043)		(0.048)
Global GDP gap		0.064								−0.127	−0.186*
		(0.044)								(0.100)	(0.105)
Local credit gap			−0.011	−0.004					−0.009		0.017
			(0.022)	(0.023)					(0.030)		(0.032)
Global credit gap				0.088*						0.203*	0.235**
				(0.051)						(0.107)	(0.116)
Local REER gap					0.030	0.030			0.106**		0.103*
					(0.022)	(0.022)			(0.052)		(0.057)
EMEs REER gap						−0.004				−0.007	0.049
						(0.042)				(0.058)	(0.068)
Local risk gap							−0.128	−0.196	−0.196		−0.375
							(0.264)	(0.281)	(0.360)		(0.433)
Global risk gap								−0.616**		−0.791***	−0.842***
								(0.242)		(0.299)	(0.310)
CCI (prev. year)	0.729***	0.665***	0.602***	0.542**	0.730***	0.730***	0.691***	0.725***	0.344	0.484**	0.448*
	(0.206)	(0.210)	(0.219)	(0.221)	(0.207)	(0.207)	(0.209)	(0.216)	(0.239)	(0.247)	(0.256)
Monetary policy									0.310	0.334*	0.322
									(0.194)	(0.197)	(0.207)
Fiscal policy									0.437**	0.458**	0.368*
									(0.181)	(0.182)	(0.190)
Pol. risk									−0.008	−0.030	−0.011
									(0.025)	(0.025)	(0.026)
Constant	−0.674***	−0.716***	−0.709***	−0.791***	−0.659***	−0.660***	−0.602***	−0.624***	−0.205	1.093	−0.084
	(0.153)	(0.157)	(0.159)	(0.169)	(0.152)	(0.152)	(0.155)	(0.161)	(1.668)	(1.664)	(1.745)
McFadden R2	0.149	0.156	0.232	0.242	0.156	0.156	0.193	0.222	0.338	0.342	0.375
Observations	217	217	194	194	217	217	202	202	174	186	174
Log Likelihood	−129.1	−128.0	−116.5	−115.0	−128.0	−128.0	−122.4	−118.0	−100.4	−99.9	−94.9
Akaike Inf. Crit.	264.2	264.1	238.9	238.0	262.1	264.1	250.8	244.1	218.8	217.8	215.7

Note: This Table presents estimation results for a logit model based on the equation 1.2. The sample covers 1997-2014 period. Reported coefficients are log of odds ratios. All continuous explanatory variables are computed using the HP-filter as discussed in Section 1.3. Standard errors are in parentheses.
* p<0.1, ** p<0.05, *** p<0.01

Table 1.6: Regression results – Capital controls on outflows

	Dependent variable:										
	Index on capital controls on outflows: 1 - tightening, 0 - easing										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Local GDP gap	−0.059**	−0.059**							−0.034		−0.065
	(0.025)	(0.027)							(0.051)		(0.058)
Global GDP gap		−0.105*								−0.204*	−0.256**
		(0.061)								(0.108)	(0.127)
Local credit gap			−0.023	−0.036					0.043		0.050
			(0.031)	(0.033)					(0.046)		(0.053)
Global credit gap				−0.102						0.048	0.106
				(0.069)						(0.116)	(0.134)
Local REER gap					−0.061*	−0.059*			−0.035		−0.018
					(0.033)	(0.034)			(0.052)		(0.057)
EMEs REER gap						−0.043				−0.049	−0.009
						(0.050)				(0.055)	(0.064)
Local risk gap							0.668*	0.674**	0.255		−0.204
							(0.342)	(0.343)	(0.501)		(0.560)
Global risk gap								−0.079		−0.436	−0.461
								(0.256)		(0.332)	(0.364)
CCO (prev. year)	1.153***	1.248***	1.152***	1.196***	1.180***	1.185***	1.107***	1.093***	0.761**	1.036***	0.832**
	(0.298)	(0.312)	(0.299)	(0.306)	(0.295)	(0.296)	(0.297)	(0.300)	(0.331)	(0.325)	(0.353)
Monetary policy									0.415*	0.444*	0.470*
									(0.248)	(0.238)	(0.262)
Fiscal policy									0.050	0.086	0.073
									(0.231)	(0.232)	(0.237)
Pol. risk									0.011	−0.014	0.008
									(0.027)	(0.026)	(0.028)
Constant	−1.192***	−1.191***	−1.152***	−1.159***	−1.119***	−1.123***	−1.054***	−1.059***	−1.883	−0.267	−1.685
	(0.205)	(0.207)	(0.203)	(0.205)	(0.199)	(0.200)	(0.201)	(0.202)	(1.804)	(1.753)	(1.858)
McFadden R2	0.197	0.212	0.221	0.233	0.183	0.187	0.201	0.202	0.282	0.280	0.313
Observations	179	179	166	166	179	179	167	167	151	161	151
Log Likelihood	−79.5	−78.0	−77.1	−75.9	−80.8	−80.5	−79.1	−79.0	−71.0	−71.3	−68.0
Akaike Inf. Crit.	165.0	164.0	160.2	159.9	167.7	168.9	164.1	166.0	160.0	160.5	161.9

Note: This Table presents estimation results for a logit model based on the equation 1.2. The sample covers 1997-2014 period. Reported coefficients are log of odds ratios. All continuous explanatory variables are computed using the HP-filter as discussed in Section 1.3. Standard errors are in parentheses.
* p<0.1, ** p<0.05, *** p<0.01

Table 1.7: Regression results – Macroprudential policies

	Dependent variable:										
	Index on macroprudential policies: 1 - tightening, 0 - easing										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Local GDP gap	0.000	0.005							−0.024		−0.019
	(0.014)	(0.014)							(0.029)		(0.038)
Global GDP gap		0.166***								−0.059	−0.072
		(0.039)								(0.073)	(0.080)
Local credit gap			0.007	0.020					0.005		0.014
			(0.016)	(0.017)					(0.025)		(0.032)
Global credit gap				0.120**						0.184**	0.199**
				(0.049)						(0.083)	(0.095)
Local REER gap					0.010	0.010			0.030		0.015
					(0.017)	(0.017)			(0.028)		(0.034)
EMEs REER gap						−0.004				−0.011	0.018
						(0.039)				(0.041)	(0.052)
Local risk gap							−0.179	−0.187	−0.191		−0.085
							(0.177)	(0.202)	(0.201)		(0.261)
Global risk gap								−0.890***		−0.994***	−1.016***
								(0.159)		(0.181)	(0.187)
MP (prev. year)	0.752***	0.478***	0.747***	0.649***	0.747***	0.750***	0.657***	0.721***	0.620***	0.754***	0.694***
	(0.162)	(0.176)	(0.162)	(0.167)	(0.162)	(0.166)	(0.167)	(0.188)	(0.172)	(0.207)	(0.216)
Monetary policy									0.115	0.165	0.091
									(0.147)	(0.166)	(0.173)
Fiscal policy									0.022	−0.043	−0.068
									(0.141)	(0.158)	(0.163)
Pol. risk									−0.012	−0.014	−0.011
									(0.020)	(0.022)	(0.024)
Constant	0.606***	0.740***	0.609***	0.654***	0.612***	0.610***	0.662***	0.810***	1.464	1.694	1.517
	(0.131)	(0.142)	(0.131)	(0.135)	(0.131)	(0.132)	(0.136)	(0.153)	(1.370)	(1.480)	(1.579)
McFadden R2	0.093	0.146	0.093	0.110	0.094	0.094	0.139	0.292	0.145	0.270	0.313
Observations	302	302	302	302	302	302	287	287	287	302	287
Log Likelihood	−177.5	−167.1	−177.4	−174.1	−177.4	−177.3	−168.5	−138.6	−167.3	−142.9	−134.4
Akaike Inf. Crit.	361.0	342.3	360.9	356.2	360.7	362.7	343.0	285.1	352.7	303.8	294.8

Note: This Table presents estimation results for a logit model based on the equation 1.2. The sample covers 2000-2014 period. Reported coefficients are log of odds ratios. All continuous explanatory variables are computed using the HP-filter as discussed in Section 1.3. Standard errors are in parentheses.
* p<0.1, ** p<0.05, *** p<0.01

Table 1.8: Regression results – Multinomial logit model

	Dependent variable: Index on CFM policy: 1 - tightening, -1 - easing, and 0 - no change.								
	MP policy			CC on inflows			CC on outflows		
	1 vs.0	-1 vs.0	1 vs.-1	1 vs.0	-1 vs.0	1 vs.-1	1 vs.0	-1 vs.0	1 vs.-1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Local GDP gap	−0.015	−0.018	0.003	−0.017	−0.024**	0.006	−0.042***	0.008	−0.050***
	(0.013)	(0.013)	(0.016)	(0.013)	(0.010)	(0.015)	(0.014)	(0.013)	(0.018)
Global GDP gap	0.042*	−0.134***	0.176***	0.083**	−0.003	0.086**	−0.059	0.011	−0.070
	(0.023)	(0.031)	(0.036)	(0.036)	(0.025)	(0.042)	(0.049)	(0.025)	(0.054)
Observations	1344	1344	1344	1632	1632	1632	1632	1632	1632
Log Likelihood	-787.4	-787.4	-787.4	- -681.5	-681.5	-681.5	-574.6	-574.6	-574.6
Akaike Inf. Crit.	1,682.8	1,682.8	1,682.8	1,470.9	1,470.9	1,470.9	1,257.2	1,257.2	1,257.2
Local credit gap	−0.002	−0.021	0.019	0.005	0.011	−0.006	−0.038	−0.005	−0.033
	(0.012)	(0.015)	(0.018)	(0.019)	(0.013)	(0.022)	(0.026)	(0.013)	(0.028)
Global credit gap	0.053**	−0.062	0.115***	0.133***	0.037	0.096*	−0.069	0.012	−0.081
	(0.026)	(0.038)	(0.043)	(0.042)	(0.031)	(0.050)	(0.059)	(0.030)	(0.064)
Observations	1344	1344	1344	1536	1536	1536	1536	1536	1536
Log Likelihood	-796.7	-796.7	-796.7	-612.2	-612.2	-612.2	-533.9	-533.9	-533.9
Akaike Inf. Crit.	1,701.4	1,701.4	1,701.4	1,332.3	1,332.3	1,332.3	1,175.9	1,175.9	1,175.9
Local REER gap	−0.016	−0.024	0.008	0.003	−0.032***	0.035*	−0.035**	0.020	−0.055**
	(0.015)	(0.017)	(0.020)	(0.017)	(0.012)	(0.020)	(0.017)	(0.015)	(0.022)
EMEs REER gap	−0.003	−0.014	0.011	−0.027	−0.021	−0.006	−0.051	0.007	−0.058
	(0.023)	(0.030)	(0.035)	(0.036)	(0.025)	(0.042)	(0.048)	(0.025)	(0.053)
Observations	1344	1344	1344	1632	1632	1632	1632	1632	1632
Log Likelihood	-799.8	-799.8	-799.8	-683.2	-683.2	-683.2	-576.8	-576.8	-576.8
Akaike Inf. Crit.	1,707.7	1,707.7	1,707.7	1,474.4	1,474.4	1,474.4	1,261.6	1,261.6	1,261.6
Local risk gap	0.053	0.212	−0.159	−0.020	0.186	−0.206	0.449*	−0.340*	0.789***
	(0.161)	(0.164)	(0.214)	(0.244)	(0.159)	(0.281)	(0.248)	(0.180)	(0.300)
Global risk gap	−0.261**	0.740***	−1.001***	−0.351*	0.188**	−0.539**	−0.071	0.054	−0.125
	(0.129)	(0.088)	(0.145)	(0.204)	(0.087)	(0.217)	(0.211)	(0.099)	(0.229)
Observations	1279	1279	1279	1531	1531	1531	1531	1531	1531
Log Likelihood	-710.7	-710.7	-710.7	-631.6	-631.6	-631.6	-536.0	-536.0	-536.0
Akaike Inf. Crit.	1,529.4	1,529.4	1,529.4	1,371.3	1,371.3	1,371.3	1,180.0	1,180.0	1,180.0

Note: This Table presents estimation results for a multinomial logit model based on the equation 1.4. The sample covers 2000-2014 period for macroprudential policies and 1997-2014 period for capital controls. Reported coefficients are log of odds ratios. Coefficients for country dummies and CFM policies at the previous year are omitted. All continuous explanatory variables are computed using the HP-filter as discussed in Section 1.3. Standard errors are in parentheses.
* p<0.1, ** p<0.05, *** p<0.01

Table 1.9: Regression results – Disaggregation by asset type and macroprudential instrument

	Dependent variable: Index on CFM policy: 1 - tightening, 0 - easing											
	MP policy				CC on inflows				CC on outflows			
	Fin. inst.-target	RR local	RR foreign	LTV ratio	Non-FDI	Equity	Debt	Credit	Non-FDI	Equity	Debt	Credit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Local GDP gap	0.0004	0.003	−0.006	0.042	−0.016	−0.023	−0.011	−0.032*	−0.055**	−0.058	−0.044	−0.054
	(0.014)	(0.017)	(0.018)	(0.059)	(0.017)	(0.054)	(0.034)	(0.019)	(0.027)	(0.039)	(0.027)	(0.035)
Global GDP gap	0.165***	0.129***	0.032	0.138	0.069	−0.036	0.017	0.143**	−0.134**	−0.036	−0.072	−0.088
	(0.039)	(0.044)	(0.063)	(0.132)	(0.044)	(0.116)	(0.091)	(0.055)	(0.064)	(0.095)	(0.090)	(0.098)
Observations	269	179	89	32	197	50	56	128	162	72	66	67
Log Likelihood	−148.2	−104.1	−51.1	−18.6	−118.8	−25.9	−32.0	−79.5	−75.0	−31.3	−30.4	−30.7
Akaike Inf. Crit.	304.5	216.3	110.3	45.2	245.5	59.9	72.1	167.1	158.0	70.6	68.9	69.3
Local credit gap	0.011	0.001	−0.048	0.198**	0.004	−0.033	0.039	−0.031	−0.025	−0.056	−0.044	−0.020
	(0.017)	(0.020)	(0.030)	(0.101)	(0.025)	(0.054)	(0.053)	(0.028)	(0.033)	(0.053)	(0.046)	(0.048)
Global credit gap	0.111**	0.108*	−0.066	0.416	0.105**	0.022	0.083	0.126**	−0.109	0.078	−0.043	−0.171
	(0.049)	(0.059)	(0.081)	(0.298)	(0.053)	(0.112)	(0.111)	(0.062)	(0.072)	(0.087)	(0.097)	(0.120)
Observations	269	179	89	32	178	47	52	115	150	66	61	60
Log Likelihood	−155.4	−106.8	−49.8	−16.7	−106.4	−25.3	−29.0	−71.8	−72.9	−29.3	−29.6	−26.8
Akaike Inf. Crit.	318.7	221.5	107.6	41.4	220.8	58.6	65.9	151.5	153.8	66.7	67.2	61.6
Local REER gap	0.009	0.006	0.016	−0.016	0.021	−0.043	0.211**	−0.001	−0.060*	−0.021	−0.039	−0.071
	(0.018)	(0.022)	(0.029)	(0.063)	(0.027)	(0.076)	(0.087)	(0.029)	(0.034)	(0.049)	(0.032)	(0.050)
EMEs REER gap	−0.010	−0.008	−0.048	0.174	0.005	−0.176*	−0.086	0.053	−0.042	−0.066	0.024	−0.048
	(0.041)	(0.045)	(0.088)	(0.152)	(0.044)	(0.106)	(0.098)	(0.056)	(0.050)	(0.074)	(0.072)	(0.068)
Observations	269	179	89	32	197	50	56	128	162	72	66	67
Log Likelihood	−158.0	−108.7	−51.1	−18.6	−120.1	−24.5	−27.7	−83.6	−78.0	−32.0	−31.6	−31.3
Akaike Inf. Crit.	324.0	225.5	110.2	45.2	248.2	56.9	63.4	175.1	164.0	72.1	71.2	70.7
Local risk gap	−0.221	−0.213	−0.018	−1.216	−0.124	−0.749	−0.505	0.022	0.615*	0.198	0.230	0.794
	(0.210)	(0.251)	(0.360)	(1.628)	(0.280)	(0.717)	(0.663)	(0.308)	(0.337)	(0.454)	(0.475)	(0.514)
Global risk gap	−0.862***	−0.918***	−1.096***	−2.032*	−0.546**	−1.840**	−1.236*	−0.411*	−0.079	0.265	−0.112	−0.251
	(0.159)	(0.215)	(0.353)	(1.165)	(0.242)	(0.882)	(0.698)	(0.225)	(0.255)	(0.301)	(0.390)	(0.424)
Observations	257	168	82	30	182	44	50	117	153	67	62	61
Log Likelihood	−124.5	−84.6	−38.3	−12.0	−110.2	−20.6	−26.7	−76.2	−76.6	−29.7	−31.4	−30.0
Akaike Inf. Crit.	257.0	177.3	84.6	32.1	228.5	49.1	61.5	160.5	161.3	67.4	70.8	68.1

Note: This Table presents estimation results for a logit model based on the equation 1.2. The sample covers 2000-2014 period for macroprudential policies and 1997-2014 period for capital controls. Fin. inst.-target = all instruments, excluding LTV ratios, Non-FDI = all instruments, excluding capital controls on FDI flows. Reported coefficients are log of odds ratios. Coefficients for a constant term and CFM policies at the previous year are omitted. All continuous explanatory variables are computed using the HP-filter as discussed in Section 1.3. Standard errors are in parentheses.
* p<0.1, ** p<0.05, *** p<0.01

Table 1.10: Regression results – Intensity of CFM measures

	Dependent variable: Number of tightening (+) or easing (-) steps		
	MP policy	CC on inflows	CC on outflows
	(1)	(2)	(3)
Local GDP gap	−0.000	0.008	−0.027***
	(0.010)	(0.009)	(0.010)
Global GDP gap	0.071***	0.034*	−0.028
	(0.018)	(0.020)	(0.022)
Observations	1,344	1,632	1,632
Log Likelihood	-1109.7	-992.8	-843.7
Akaike Inf. Crit.	2,245.4	2,067.6	1,765.4
Local credit gap	0.005	−0.005	−0.005
	(0.010)	(0.011)	(0.012)
Global credit gap	0.059***	0.032	−0.027
	(0.021)	(0.025)	(0.026)
Observations	1,344	1,536	1,536
Log Likelihood	-1093.9	-895.3	-784.1
Akaike Inf. Crit.	2,259.8	1,872.7	1,646.2
Local REER gap	0.004	0.027***	−0.032***
	(0.012)	(0.010)	(0.012)
EMEs REER gap	0.008	0.002	−0.018
	(0.018)	(0.020)	(0.022)
Observations	1,344	1,632	1,632
Log Likelihood	-1097.8	-991.2	-844.3
Akaike Inf. Crit.	2,267.6	2,064.4	1,766.7
Local risk gap	−0.088	−0.107	0.329**
	(0.107)	(0.116)	(0.130)
Global risk gap	−0.575***	−0.216***	−0.055
	(0.065)	(0.076)	(0.086)
Observations	1,279	1,531	1,531
Log Likelihood	-1011.5	-914.9	-790.0
Akaike Inf. Crit.	2,095.1	1,911.7	1,658.1

*N*ote: This Table presents estimation results for an ordered logit model. The sample covers 2000-2014 period for macroprudential policies and 1997-2014 period for capital controls. Reported coefficients are log of odds ratios. Coefficients for country dummies and CFM policies at the previous year are omitted. All continuous explanatory variables are computed using the HP-filter as discussed in Section 1.3. Standard errors are in parentheses.
p<0.1*; p<0.05**; p<0.01***.

Table 1.11: Regression results – The role of country-specific characteristics

	Dependent variable: Index on CFM policy: 1 - tightening, 0 - easing							
	Local GDP gap	Global GDP gap	Local credit gap	Global credit gap	Local REER gap	Global REER gap	Local risk gap	Global risk gap
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Macroprudential policies:								
Low & medium income	0.000	0.204 ***	0.012	0.113**	0.001	0.011	−0.368	−1.009***
High income	0.078	0.022	0.068	0.123	0.075	−0.060	0.150	−0.677**
High & medium debt	0.004	0.224***	0.018	0.138**	0.018	0.010	−0.011	−0.935***
Low debt	0.001	0.035	0.030	0.044	−0.048	−0.082	−0.996**	−0.908 **
Fixed ER	−0.031	0.164***	−0.009	0.143*	−0.065*	−0.038	−1.021 ***	−0.751 ***
Floating ER	0.046	0.153***	0.069**	0.093	0.066**	−0.027	−0.135	−0.166
Low quality inst.	0.020	0.179***	0.034	0.197**	0.007	0.031	−0.499	−1.050 ***
Good quality inst.	−0.011	0.162***	0.015	0.093	0.015	−0.028	0.100	−0.786***
Low & medium reserves	0.016	0.260 ***	0.030	0.200***	0.022	−0.013	0.091	−0.891***
High reserves	−0.092**	−0.008	−0.014	−0.035	−0.098*	0.017	−0.866**	−0.877***
Capital controls on inflows:								
Low & medium income	0.004	0.024	−0.007	0.058	0.034	−0.026	−0.009	−0.479*
High income	−0.032	0.356 **	−0.010	0.226 *	0.019	0.069	−0.779	−1.187*
High & medium debt	0.006	0.076	−0.007	0.121*	0.032	−0.008	−0.177	−0.530*
Low debt	−0.026	0.053	0.002	0.052	0.015	−0.024	−-0.289	−0.719
Fixed ER	0.052	0.100	−0.021	0.099	0.147**	0.036	−1.000*	−0.962*
Floating ER	0.013	0.082	0.023	0.106	0.032	0.013	−0.303	−0.610*
Low quality inst.	−0.003	0.036	−0.032	0.037	0.035	−0.023	0.021	−0.840 *
Good quality inst.	0.010	0.088	0.023	0.137*	0.025	0.014	−0.415	−0.547*
Low & medium reserves	−0.011	0.098*	−0.023	0.145**	0.027	−0.014	−0.008	−0.270
High reserves	0.056	0.050	0.025	−0.014	0.085	0.071	−0.481	−1.642***
Capital controls on outflows:								
Low & medium income	−0.054*	−0.162**	−0.037	−0.176**	−0.063*	−0.054	0.957**	0.064
High income	−0.099	0.299	−0.218	0.294	−0.075	−0.032	−0.390	−1.921*
High & medium debt	−0.052*	−0.064	−0.027	−0.098	−0.125**	−0.015	0.568	−0.219
Low debt	−0.087	−0.177 *	−0.081	−0.145	0.071	−0.123	1.215	−0.029
Fixed ER	−0.018	−0.011	−0.012	0.016	0.058	−0.068	−0.128	−0.037
Floating ER	−0.085	−0.152*	−0.006	−0.118	−0.141**	−0.041	0.932	0.020
Low quality inst.	−0.054*	−0.114	−0.100*	−0.202	−0.034	−0.085	1.170**	−0.301
Good quality inst.	−0.055	−0.125	0.048	−0.070	−0.132**	−0.019	0.328	0.059
Low & medium reserves	−0.061**	−0.026	−0.046	−0.077	−0.053*	−0.035	0.433	−0.161
High reserves	−0.056	−0.393**	0.009	−0.264	−0.162	−0.070	1.472*	0.260

Note: This Table presents estimation results for a logit model based on the equation 1.2. The sample covers 2000-2014 period for macroprudential policies and 1997-2014 period for capital controls. Logit models are estimated for each subsample as defined in Subsection 1.5.3. Reported coefficients are log of odds ratios. Coefficients for constant term and CFM policies at the previous year as well as standard regression statistics are omitted. Standard errors are not reported. All continuous explanatory variables are computed using the HP-filter as discussed in Section 1.3.
* p<0.1, ** p<0.05, *** p<0.01

Chapter 2

Floating with a Load of FX Debt?[1]

2.1 Introduction

Many emerging market economies (EMEs) are reluctant to let their currencies float. Even when *de jure* they announce themselves as having a floating exchange rate (ER) regime, *de facto* they are not allowing their exchange rates to move freely. One explanation of why countries may fear letting their exchange rates float is a negative influence of exchange rate volatility on balance sheets of corporates and households. When they borrow in foreign currency, while receiving income in local currency, exchange rate depreciation may lead to a sharp rise in debt-service costs, bankruptcies, and disruption of investment and consumption demand. Corporate and household sector distress can further spill over to the financial sector generating deeper financial instability, particularly if the foreign currency exposures were financed by the domestic banking system. The issue of a large foreign currency debt accumulation is especially important for emerging market economies as they are usually less able to borrow abroad in their domestic currency as compared to advanced economies (Eichengreen et al., 2003). The problem is amplified by lack or high costs of hedging, especially for households and small and medium size firms. In addition, moral hazard could amplify the problem as households, companies, and banks that expect to be bailed out – directly by governments or indirectly by central bank policies aimed to curb depreciation pressures – do not internalize their risks and may borrow more in foreign currency.

There is a vast theoretical and empirical literature focusing on whether and how countries react to exchange rate pressure. Calvo and Reinhart (2002) analyze the behavior

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of exchange rates, foreign exchange (FX) reserves, and interest rates across different exchange rate arrangements and find that countries that claim they are floating are often not. Many emerging market economies seem to use interest rates and FX market interventions to stabilize exchange rates, mostly, due to lack of credibility of central banks' policies, high pass-through from exchange rates to prices, or negative balance sheet effects from exchange rate movements. The last channel is the focus of this paper.

In our paper, we assess whether countries with high FX debt of non-financial firms and households tend to react more strongly to exchange rate pressure assuming that the decision to borrow in FX is exogenous. We rely on a set of 15 emerging market economies using monthly data for the 2002-2015 period. We look at two instruments that can be used to manage exchange rates – adjustment of policy rates and FX interventions using central bank's FX reserves – and analyze whether the level of FX debt affects the sensitivity of these instruments to exchange rate changes.

Our findings suggest that countries with large FX debt in the non-financial private sector tend to react more strongly to exchange rate pressure using both FX interventions and monetary policy rates. The results are driven mainly by reactions to depreciation of exchange rates and we find that FX debt in the non-financial private sector from domestic sources is a more important driver of central bank policies than the debt obtained directly from abroad. The importance of FX debt in inhibiting central banks from allowing exchange rates to move freely implies that monetary policy could be overburdened by multiple goals. Policies should focus on limiting FX lending by the domestic banking system to ensure that monetary policy can work effectively.

Our paper is most closely related to studies on the use of different policy instruments to stem exchange rate volatility. The existing theoretical and empirical literature shows that monetary policy (Garcia et al., 2009; Filosa, 2001) and FX interventions (Benes et al., 2015; Blanchard et al., 2015; Adler and Tovar, 2011) are the most widely used tools for stabilization of exchange rates. The other strand of literature claims that countries that borrow internationally in FX are those that tend to adopt fixed exchange rate regimes (Hausmann et al., 2001; Harms and Hoffmann, 2011; Honig, 2005), i.e. fear of floating arises due to liability dollarization. In our paper, we combine two strands of literature and look at how policies – policy rates and FX interventions – react to exchange rate changes allowing the variation of responses to differ with the amount of the non-financial private sector FX debt. Throughout the paper, we treat FX debt as exogenous and do not directly account for potential endogeneity of FX debt. However, we discuss why we believe the results should be robust to a potential endogeneity of FX debt.

Our paper contributes to the existing literature in a number of dimensions. First, we focus on the influence of private sector FX exposures and account directly for externally

and domestically financed FX borrowing, whereas most papers look either at banks' liability dollarization or the total FX debt of the country. This allows us to reach specific conclusions on which forms of FX debt matter more for the use of FX interventions and monetary policy rates, thus drawing relevant policy conclusions from our findings. Second, we distinguish between the effects of appreciation and depreciation of exchange rates, revealing that currency depreciation may threaten financial stability due to balance sheet effects.

The rest of the paper is organized as follows: In Section 2.2, we provide literature review, Section 2.3 presents the data and stylized facts about FX exposures as well as discusses empirical methodology, Section 2.4 presents our main results and performs a number of robustness checks and extensions, and Section 2.5 concludes and provides an outlook for further research.

2.2 Literature review

Liability dollarization is considered to be one of the factors that cause central banks to care about exchange rate stability. Cespedes et al. (2004) show that balance sheet effects magnify the effects of foreign disturbances through increase in country risk premium. They claim that flexible exchange rates are better absorbers of real foreign shocks than fixed rates are, even conditioning on large balance sheet effects. Empirically, however, Hausmann et al. (2001), Harms and Hoffmann (2011), and Honig (2005), among others, show that liability dollarization plays a central role in producing "fear of floating." The first two papers use the choice of exchange rate regime as a dependent variable and Honig (2005) explores the influence of the ability to borrow internationally in local currency on exchange rate volatility relative to the volatility of policy instruments.

To stabilize exchange rates, central banks can use monetary policy rates and FX interventions as well as less conventional instruments such as capital controls or exchange rate-linked instruments. Benes et al. (2015) gives theoretical justifications for including sterilized interventions as an additional central bank instrument alongside the Taylor rule and find that there can be advantages for combining inflation targeting with some degree of exchange rate management. Ghosh et al. (2016) examine the case for using two instruments and show that the use of FX interventions as the second instrument improves welfare under both discretionary monetary policy and inflation targeting regime. Empirically, Mohanty and Klau (2004), Filosa (2001), Garcia et al. (2009), among others, show that central banks strongly respond to exchange rate movements using policy rates. Garcia et al. (2009) argue that, for financially-vulnerable emerging market economies, some exchange rate smoothing is beneficial, largely reflecting perverse effects of demand shocks

on exchange rate movements. Adler et al. (2015), Blanchard et al. (2015), and Adler and Tovar (2011) suggest that (sterilized) FX interventions are effective in affecting exchange rates. The effectiveness depends on the depth of the financial market (Adler et al., 2015) and it decreases rapidly with the degree of capital account openness (Adler and Tovar, 2011).

In addition, literature focuses on how choice of the ER regime and central bank's policies may influence agents' borrowing behavior. Arteta (2002) suggests that floating exchange rate regimes exacerbate currency mismatches in domestic financial intermediation as those regimes seem to encourage deposit dollarization more strongly than they encourage matching via credit dollarization. On the contrary, Kamil (2012), using firm level data, finds that after countries switch from pegged to floating exchange rate regimes, firms decrease their levels of foreign currency exposures by reducing the share of debt contracted in foreign currency and matching more systematically their foreign currency liabilities with assets denominated in foreign currency and export revenues. Two-way causality is addressed by Chang and Velasco (2006) and Hamon and Hausmann (2005). In Chang and Velasco (2006) residents choose in which currency to borrow and the central bank, in turn, chooses exchange rate regime. "Fear of floating" emerges endogenously and in association with a currency mismatch in assets and liabilities. At the same time, the choice of currency of borrowing depends on the residents' expectations regarding the central bank's policy. Both fixed and floating exchange rate regimes can be an equilibrium, while the latter is Pareto-efficient. Empirically, Berkmen and Cavallo (2010) confirm that countries with high liability dollarization (external, public, or financial) tend to be more actively involved in exchange rate stabilization operations. However, their results suggest that there is no evidence that floating, by itself, promotes de-dollarization.

2.3 Empirical analysis

2.3.1 Data and summary statistics

While balance sheet currency mismatches may appear in all sectors, in this paper, we focus on the non-financial private sector (households and non-financial companies). The corporate debt of non-financial firms across major emerging market economies had an upward trend in recent years due to favorable global financial conditions (IMF, 2015). On the one hand, greater leverage can boost investment and economic growth. On the other hand, a possibility of a rise in monetary policy rates in key advanced economies and subsequent depreciation of local currencies of emerging market economies may increase debt-service costs and impose currency risks on leveraged firms, especially if their debt is denominated

in a foreign currency. At the same time, banks in floating exchange rate regimes are likely to either keep a balance between their FX assets and liabilities or, at least, hedge on-balance sheet open positions through off-balance sheet operations. Government FX exposure, while being important for the public sector risk, is assumed not to be taken into account by the monetary authority as this can less easily be justified within a typical central bank's mandate of maintaining price and financial stability.

We consider two sources of FX exposure of the non-financial private sector (Figure 2.1). The first is borrowing directly from abroad, which we obtain from Quarterly External Debt Statistics. The second is FX lending from the financial sector – funded mainly through banks' borrowing abroad (in FX) as intermediaries of capital inflows or from accepting local FX deposits (deposit dollarization). We obtain this data from the IMF Monetary and Financial Statistics.

Our sample includes 15 emerging market countries with floating exchange rates.[2] We use monthly data for the 2002-2015 period (subject to data availability). A full description of the variables and data sources are presented in the Appendices 2.A-2.B.

We use the change in the net foreign assets (NFA) position of the central bank in percent of GDP as a proxy for FX interventions. As a robustness check, we clean this measure for valuation effects. In addition, we use other proxies such as the change in official reserves minus gold in percent of GDP and the change in NFA relative to M2. For the policy rate, we use the interbank rates, where possible, and short-term government bond yields in the remaining cases.[3] The summary statistics are presented in Table 2.2.

The average FX debt of the countries in our sample increased during the global financial crisis to almost 25% of GDP on average from less than 20% before the crisis as shown in Figure 2.2. The domestic part of FX debt was increasing up to year 2009 and remained constant thereafter. In 2003, FX exposures from the domestic banking system only accounted for about a quarter of total FX exposures; since 2009, domestic and external FX debt has been roughly of the same size. Countries have not managed to bring down the overall FX exposures of the non-financial private sector and, in many countries, the exposures are large enough that exchange rate volatility (in particular, depreciations) can have significant implications for corporate and household balance sheets. As shown in Figure 2.3, the size of FX debt varies widely across countries from less than 5% of GDP to over 50% of GDP. In addition, composition of the FX debt varies across countries.

[2]We include countries that are classified as "emerging market and developing countries" in the April 2015 World Economic Outlook. In addition, the choice of countries into the final sample is restricted to those for which data for both domestic and external debt of the non-financial private sector is available.

[3]We also use the actual official monetary policy rates of the countries as dependent variables. However, for countries where the monetary policy framework is not based on only one policy rate to affect market rates (e.g. Turkey), but instead is based on several policy rates, we use market rates as a better indication of the monetary policy stance.

For some, the FX debt is almost exclusively a result of borrowing directly from abroad, whereas for many of the countries with large FX exposures, most of it is financed from domestic sources. Finally, the data shows that external FX debt exhibits less cross-country variation than domestic FX debt.

We split the sample based on the FX debt, where we define FX exposures as being high when the total FX debt for a given country at a specific time is more than 20% of GDP.[4] FX interventions are generally larger when FX exposures in the non-financial private sector are high, as shown in Figure 2.4. Moreover, FX interventions are more negatively correlated with changes in exchange rates when FX debt is high with correlation being equal to -0.33 against a correlation of -0.16 for a low-FX-debt sample. The correlation is driven by selling FX in the market when the currency depreciates rather than by buying FX during appreciation episodes.

For policy rates, Figure 2.5 shows that in countries with low FX debt, policy rate changes are smaller than in countries with high FX debt. In addition, the correlation of changes in policy rates and exchange rates is larger (correlation is equal to 0.14) and statistically significant for high-FX-debt countries as compared to a non-significant correlation of 0.04 for a low-FX-debt sample.

If countries with high FX exposures are more reluctant to allow the exchange rates to float freely, this would manifest itself in reserves and policy rates that are more volatile (as countries use these instruments more actively to try to stabilize exchange rates). Calvo and Reinhart (2002) show for a large sample of countries that many of them exhibit fear of floating. They find that their volatility in reserves and interest rates is generally higher and the exchange rate volatility is lower than for the most free floating exchange rate regimes (such as the US, Japan, and Australia).

Letting x^c denote some critical threshold, we estimate the probability that an absolute value of a variable x (changes in NFA or policy rates) falls within some specified bounds[5], conditioning on the amount of FX debt. In our notation, we should observe:

$$Prob(abs(x) > x^c | FX\ Debt = High) > Prob(abs(x) > x^c | FX\ Debt = Low) \qquad (2.1)$$

Indeed, countries with high FX exposure show higher volatility in NFA and policy rates as shown in Table 2.3. However, exchange rate changes are not lower in these countries. This could indicate that countries with high FX debt face larger exchange rate pressure. Therefore, despite their attempts to limit exchange rate volatility, they

[4]The 20% threshold is chosen because roughly half of the observations fall in each group. The results are robust to the choice of the threshold.

[5]We use thresholds of 2.5% for exchange rates, 0.5 percentage points for policy rates, and 0.5% of GDP for changes in NFA. The results are generally robust for other choices of thresholds.

experience exchange rate movements as large as countries that intervene less. When calculating an intervention index, the results are confirmed; countries with high FX debt show a higher degree of exchange rate management.

2.3.2 Methodology

We assume that central banks at emerging market economies use policy rates and foreign exchange reserves as instruments for managing exchange rates.[6] We suppose that these instruments work independently of each other. Therefore, we estimate two separate equations with foreign exchange interventions (FXI) and policy rates as dependent variables and analyze whether the correlation between policy instruments and exchange rate changes is amplified by the stock of foreign exchange debt (FXD) in the non-financial private sector. We estimate the following equation for FXI:

$$FXI_{i,t} = \alpha_i + \gamma_1 \Delta ER_{i,t} + \gamma_2 \Delta ER_{i,t} \times FXD_{i,t-1} + \beta controls_{i,t} + \varepsilon_{i,t} \tag{2.2}$$

$$\frac{\partial FXI_{i,t}}{\partial \Delta ER_{i,t}} = \gamma_1 + \gamma_2 FXD_{i,t-1} \tag{2.3}$$

where the first term on the right hand side is a country-specific fixed effect, the second is a percent change of a country j's exchange rate relative to US dollar (USD), and the third is the exchange rate change interacted with a lagged FX debt-to-GDP. Following a financial-stability model by Obstfeld et al. (2008), control variables include trade openness to GDP, lagged current account balance to GDP, change in money stock (M2) to GDP, lagged exchange rate change, lagged reserves relative to imports and M2, as well as a change and a lagged level of FXD. The interaction term allows the coefficient on the exchange rate change to vary with the level of FX debt and the expected negative sign of γ_2 would indicate that, for countries with high FX debt, higher exchange rate pressure is related to bigger changes in NFA. The sign on the exchange rate change (γ_1) is ambiguous as this can be interpreted as the reaction to exchange rate movements of a country with a zero FX debt.

The second equation is an extended Taylor rule equation following Taylor (2001) and Mohanty and Klau (2004), which is expanded to include an interaction between exchange rate changes and FX debt of the non-financial private sector:

$$i_{i,t} = \alpha_i + \theta_1 \Delta ER_{i,t-1} + \theta_2 \Delta ER_{i,t-1} \times FXD_{i,t-1} + \beta controls_{i,t} + \varepsilon_{i,t} \tag{2.4}$$

[6] Central banks may use other instruments to manage exchange rates such as capital controls, changes in FX reserve requirements, exchange rate-linked instruments, or other policies that affect FX markets. In this paper, however, we restrict the analysis to FX interventions and monetary policy rates.

$$\frac{\partial i_{i,t}}{\partial \Delta ER_{i,t-1}} = \theta_1 + \theta_2 FXD_{i,t-1} \tag{2.5}$$

where $i_{j,t}$ is the nominal policy rate of country j at time t. As in a standard Taylor rule, the central bank is expected to react to inflation, π, and the output gap, $(\hat{y})$, with the lagged policy rate included as explanatory variable to allow for persistence in adjusting policy rates. We assume that countries have different policy rules with regard to inflation, output gap, and lagged policy rates by allowing these coefficients to be country-specific.[7,8] We include lags of exchange rate changes and the interaction term to take into account that central banks' policy rate reaction to exchange rate changes may happen with a lag. The parameter of interest is θ_3. As before, if it is significant – and now with an expected positive sign – it indicates that higher FX debt leads to a stronger association between exchange rate changes and policy rates, that is higher (lower) policy rates are related to depreciating (appreciating) exchange rates.

Instrumental variables. Both equations suffer from an endogeneity problem as FX interventions and changes in policy rates affect exchange rates behavior. If countries intervene to stabilize exchange rates, exchange rate changes will be smaller and changes in FX interventions and policy rates will be larger. Thus, a coefficient for the exchange rate changes interacted with FX debt is biased towards a larger reaction to exchange rate changes. Using country-specific fixed effects in the regressions partially alleviates endogeneity concerns as time-invariant unobserved country factors that may affect both policy variables and changes in exchange rates are controlled for.

Further, to address the endogeneity issue, we use instruments for changes of exchange rate. A good instrument is the one that is correlated with exchange rate changes, but not with FX interventions and policy rates. We use a change in the Emerging Markets Bond Index (EMBI) spread and VIX separately and in combination as instrumental variables.[9] As the effect of the global factors on individual countries exchange rates varies across countries, we interact these global variables with country-specific dummies (D_i).

[7] We do not include the inflation target and natural real interest rate in the reaction function. However, these terms are captured by a constant term (which in the fixed effect regression differs across countries) as long as they do not change over the sample period. Including the inflation target and natural real interest rate that varies over time is challenging as 1) measuring the natural real interest rate over time for countries is highly uncertain and 2) not all countries in the sample target inflation.

[8] As a robustness check, we do not allow inflation, output gap, and lagged policy rates to be country-specific. The results still hold.

[9] VIX is the Chicago Board Options Exchange Market Volatility index. It is a measure of the implied volatility of S&P500 Index options. EMBI is the J.P. Morgan Emerging Markets Bond index that measures the total return performance of international government bonds issued by emerging market economies.

Therefore, the set of instruments is given by[10, 11]:

$$\begin{aligned} D_1 \times \Delta VIX_t, ..., D_{15} \times \Delta VIX_t, (FXD_{j,t-1} \times \Delta VIX_t); \\ D_1 \times \Delta EMBI_t, ..., D_{15} \times \Delta EMBI_t, (FXD_{j,t-1} \times \Delta EMBI_t) \end{aligned} \tag{2.6}$$

VIX is associated with capital flows (Rey, 2015) and EMBI approximates the ability of debt repayment; both of them are used as proxies for risk aversion and uncertainty. Changes in VIX and EMBI show a high degree of co-movement with changes in bilateral exchange rates (correlations of the exchange rate changes with the change in VIX and the EMBI spread are 0.35 and 0.48 respectively), showing that a rise in VIX and EMBI tends to exert depreciation pressure on the bilateral exchange rates. As shown in Figure 2.6, both indexes capture exchange rate changes well especially during periods of financial distress (highlighted in red). Additionally, the first stage regressions (the corresponding regression results are not reported and are available upon request) show that coefficients on the instruments are jointly different from zero for both equations.

At the same time, we consider changes in VIX and the EMBI spread to be exogenous events, which are not directly affected by FX interventions and monetary policy decisions of the individual countries in our sample. Further, we assume that FX interventions and monetary policy rates are affected by VIX and the EMBI spread only through changes in exchange rates. The last assumption is rather strong as in times of uncertainty policy rates and changes in NFA may occur for reasons other than management of exchange rates.

2.4 Empirical results

2.4.1 Baseline results

Table 2.4 presents the estimation results for a simple fixed effects and a 2SLS with fixed effects regressions with FX interventions as a dependent variable.[12] All control variables for our regressions have the expected signs and are statistically significant with the exception of coefficients on FX debt-to-GDP and trade openness to GDP. In line with Adler et al. (2015) and Obstfeld et al. (2008), we show that increase in financial liabilities that could potentially be converted into foreign currency (M2), growth of FX debt, and higher current

[10] Our baseline results are reported using changes of VIX as the only instrument for changes of exchange rate. In Section 2.4.2, we replicate the results using changes of EMBI and a combination of changes of EMBI and VIX as instruments.

[11] Changes in VIX are used as instrumental variables for changes in exchange rates in Equations 2.2 and 2.4. $FXD_{j,t-1} \times \Delta VIX_t$ is used as an instrument for an interaction term $FXD_{j,t-1} \times \Delta ER_{i,t}$ in Equation 2.2.

[12] Throughout this Chapter, we interpret the results based on 2SLS regressions.

account balance to GDP are associated with higher NFA. The coefficient for a percent change in the nominal exchange rate is -0.02, but it is not statistically significant. The coefficient on the interaction term is highly significant and with the right sign. The coefficient of -0.16 implies that, for a 10% depreciation pressure, FX interventions increase by 0.16% of GDP for every additional 10% of FX debt-to-GDP. Using the latest available data on FX debt of the non-financial private sector for each country, Figure 2.7 illustrates the level of FX interventions associated with a 10% depreciation (based on the regression estimates).

For the monetary policy rate equation, standard control variables, such as output gap, lagged policy rate, and inflation are statistically significant and have the right signs (Table 2.5). The results indicate that in the absence of FX debt, the policy rate reaction to exchange rate movements is limited. This is in line with a traditional Taylor rule approach where monetary policy reacts to inflation and the output gap. However, when exchange rate changes are interacted with FX debt, the coefficient becomes statistically significant. The coefficient of 0.08 implies that, for a country with a 10% of FX debt-to-GDP, a 10% depreciation is associated with an increase in policy rate by 0.08 percentage point in the following month. The reason why the coefficient is significant with a one-month lag – instead of contemporaneously – is likely due to the fact that decisions on changes in policy rates as opposed to decisions to do FX interventions are taken in planned policy meetings that occur with a lower frequency. Moreover, since policy rate inertia is high (the coefficient for a lagged policy rate is 0.73-0.99) a longer lasting depreciation will be related to a further increase in policy rates. For the countries in our sample, Figure 2.8 shows a total increase in policy rates over the first month and a quarter (cumulative) that is associated with a 10% deprecation. For the cumulative response of policy rates, we assume that the other variables such as inflation and output gap stay constant. As expected, the effect is larger for countries with high levels of FX debt.

External vs. domestic FX borrowing. We separate our analysis into domestically and externally funded FX borrowing. Central banks are likely to be more concerned about FX exposures in the non-financial private sector if they are financed through lending by the domestic banking system. The reason is that negative consequences of a depreciation for the real sector may further spill over to the financial sector. Firms and households that experience a deterioration of their balance sheets would subsequently start de-leveraging by cutting back their consumption and investment. The financial instability effect is more pronounced if FX debt of the non-financial private sector is financed by the domestic banking system as depreciation will then affect banks' balance sheets negatively through non-performing FX loans, which could lead to insolvency of the financial institutions and a slowdown in credit growth. Our analysis confirms this claim, as shown in Tables 2.6- 2.7.

When we include only domestically financed FX debt, the coefficients on the interaction term increase in absolute value for the policy rate and FX intervention regressions. At the same time, for the external debt, the coefficients become statistically insignificant.

Appreciation vs. depreciation of exchange rates. Next, we differentiate between exchange rate depreciation and appreciation. Central banks may be more sensitive to depreciation pressure as a sharp currency depreciation threatens financial stability when the non-financial private sector has FX liabilities. At the same time, central banks may also be induced to counteract appreciations as real ER appreciations negatively affect export performance. To account for potential asymmetries, we multiply the interaction term of FX debt and exchange rate changes by a dummy variable that takes the value of 1 if the exchange rate change is negative (appreciation). As shown in Tables 2.8- 2.9, both FX interventions and changes in policy rate are mostly driven by a depreciation pressure. On average, if a country has a 10% FX debt-to-GDP, a 10% depreciation is associated with a decrease in NFA by 0.4% of GDP and an increase in policy rate by 0.15 percentage points (Figure 2.9).

The coefficients for appreciation pressure are much smaller and not statistically significant (the χ^2-statistic for a joint significance of the coefficients is 0.76 and 1.78 for FX interventions and policy rate equations, respectively).[13] Our results differ from Levy-Yeyati et al. (2013), which show that, in most cases (and increasingly so in the 2000s), interventions were aimed at limiting appreciation rather than depreciation of exchange rates. However, the authors do not account for countries' FX indebtedness.

2.4.2 Robustness checks and extensions

The definition of FX interventions. We check if our results are robust to a number of alternative specifications of FX interventions. Apart from using changes in NFA relative to GDP, we use changes in NFA relative to M2 and change in reserves minus gold relative to GDP as dependent variables in equation 2.2. These alternative specifications do not change the results qualitatively (Table 2.10).

Our proxy for FX interventions – the change in NFA of the central bank – could change for reasons other than FX interventions. Importantly, we implicitly assume that reserves are denominated in USD, while in reality it is a mix of currencies. To correct for valuation effects, we use the Currency Composition of Official Foreign Exchange Reserves (COFER) database for Emerging Markets and calculate changes in NFA adjusted for valuation effects.

[13]The following equations are estimated: $FXI_{i,t} = \alpha_i + \gamma_1 \Delta ER_{i,t} + \gamma_2 \Delta ER_{i,t} \times FXD_{i,t-1} + \gamma_3 \Delta ER_{i,t} \times FXD_{i,t-1} \times Dummy(\Delta ER_{i,t} < 0) + \beta controls_{i,t} + \varepsilon_{i,t}$ and $i_{i,t} = \alpha_i + \theta_1 \Delta ER_{i,t-1} + \theta_2 \Delta ER_{i,t-1} \times FXD_{i,t-1} + \theta_3 \Delta ER_{i,t-1} \times FXD_{i,t-1} \times Dummy(\Delta ER_{i,t-1} < 0) + \beta controls_{i,t} + \varepsilon_{i,t}$. We test the following hypotheses: for FX interventions, H0: $\gamma_1 + \gamma_2 + \gamma_3 = 0$; for policy rates, H0: $\theta_1 + \theta_2 + \theta_3 = 0$.

Additionally, we correct for movements in the net position of derivatives as central banks may intervene in the FX currency market by engaging in forwards or futures operations, which do not show in the NFA of the central banks. None of these adjustments changes the overall conclusion.[14]

The choice of exchange rate measure. For our baseline results, we use the nominal bilateral exchange rate with the USD. While we believe this is likely to be the variable of concern for most of the countries in our sample, we explore different specifications for robustness check. We use real bilateral exchange rate with the USD, nominal effective exchange rates (NEER), and mixed series where we choose the bilateral euro exchange rate for European countries and the USD exchange rate for the remaining countries (Tables 2.11-2.12, the latest are not reported and are available upon request). Again, our results are robust to these alternative specifications.

Alternative instruments. For our baseline regressions, we use VIX change as the only instrument. In addition, we estimate regressions using the EMBI change and a combination of VIX and EMBI changes as additional instruments (Tables 2.13-2.14). The differences in the results from using these alternative specifications are also small and the main conclusions hold. Additionally, we report a test of overidentifying restrictions (χ^2-statistics) with the null hypothesis of a joint validity of the instruments. We cannot reject the null that our instruments are valid.

Including the FX debt of banks and government. Throughout the paper, we assume that FX exposures of banks and governments do not affect central bank's policies. While banks are likely to hedge on-balance sheet FX exposure, exchange rate volatility may still affect banks' balance sheets due to differences in maturities of assets and liabilities. To account for FX exposures of banks, we use net open position of the banking system. An important caveat is that we are only able to take into account the on-balance sheet net open FX positions of the banks and, thus, ignore off-balance sheet hedges. These can be large as it is the case, for example, for Turkey at the end of the sample period.[15] When we run regressions separately for government debt and net open position of banks as the only FX exposures, the coefficients on exchange rate changes interacted with FX debt become statistically insignificant for both NFA and policy rate equations (Tables 2.15-

[14]The data on currency composition of reserves is available only on an aggregated level for emerging markets and advanced economies. Thus, by using the average composition for EMEs, we assume that the currency composition is the same across countries in our sample. At the same time, it is highly likely that there are large variations across countries (e.g. countries in Europe may have a larger share of euros than Asian or Latin American countries) and the valuation adjustment may add more noise than information. For our baseline regressions, we therefore use the unadjusted NFA series.

[15]Turkey is the country with the largest banking sector on-balance sheet net open FX position in the first quarter of 2015 (about 8% of GDP). However, due to off-balance sheet hedges (for which data exists for Turkey) of roughly the same amount, the overall FX exposures of the banking system in Turkey are almost negligible as of the first quarter of 2015.

2.16). Therefore, the results suggest that FX debt of the non-financial corporations and households is indeed more important than that of the government and banks in affecting policies that aim to stem exchange rate pressure.

Non-linearities. We analyze two types of non-linearities. The first is a non-linearity with respect to FX debt; is it the case that the association between policy variables (FX interventions and policy rates) and exchange rate changes not only increases with the level of FX debt but becomes much stronger if FX debt is very high? The second is a non-linearity with respect to the exchange rate changes. Are policy variables more sensitive to large changes in exchange rates? We do not find support for any of these non-linearities with the only exception of an influence of large exchange rate changes on policy rates, as shown in Tables 2.17-2.18.

Endogeneity of FX debt. One potential bias in the estimates may arise from an endogeneity in the level of FX debt of the non-financial private sector. As mentioned earlier, the choice of whether to borrow in FX or not may depend on expectations of the future policy reactions to exchange rate movements. We assume that changes in FX debt are likely to be less affected by expectations of the central bank's policies far into the future. To limit potential endogeneity of FX debt, we run the regressions using a much longer lag (three years) for FX debt. Our results are robust to this specification (the results are not reported and are available upon request). However, we acknowledge that if high FX exposures three years ago are driven by expectations (which can be self-fulfilling) that today's policy will react strongly to exchange rate movements, the use of longer lags will not guarantee that the results are unbiased. This would require measurement of the exogenous component of the level of FX exposure in the non-financial private sector, which is not a part of this paper.

Another potential source of endogeneity is institutional aspects of monetary and exchange rate policies that may affect both monetary policy design and the choice of the currency of debt denomination. If institutional aspects are time-invariant, then country fixed effects in our baseline regressions capture them. One specific example of an institutional change is Flexible Credit Line Agreement (FCL) with the IMF for Mexico, Poland, and Colombia in 2009. FCL augments the access to official reserves, thus supplementing the potential FX reserves available to dampen exchange rate volatility. To account for this change, we run baseline regressions excluding three countries after an introduction of the FCL from the sample (the results are not reported and are available upon request). The baseline results still hold.

2.5 Conclusion and outlook

Countries with floating exchange rate regimes are often reluctant to allow their currencies to float freely. In this chapter, we show that balance sheet currency mismatches are important for producing "fear of floating." We find that policymakers react more strongly to exchange rate pressure – depreciation in particular – when FX debt in the non-financial private sector is high. They use both FX interventions and monetary policy rates. We find that for every additional 10% FX debt-to-GDP, a 10% depreciation is associated with a decrease in NFA by 0.2% of GDP and an increase in policy rates by 0.08 percentage points in the next month and by about 0.2 percentage points cumulative over the following three months. Moreover, the funding source of the FX exposures matters. FX debt of the non-financial private sector financed from a domestic banking sector seems to be more important in producing fear of floating than FX debt obtained directly from abroad.

Such reaction might be optimal given the negative implications for financial stability from excessive exchange rate movements in countries with large FX exposures. However, our findings do not allow us to corroborate optimality. Other factors, such as pressure on central banks to protect important sectors in the economy (and possibly large financial and non-financial firms and households) where FX indebtedness is high, could also be at work. Thus, one should be careful about drawing policy conclusions based on the assumption that the observed policies reflect an optimal monetary policy or optimal FX interventions. However, theoretical literature supports that when foreign currency balance sheet mismatches are large, some exchange rate management may be the optimal central bank policy (while not necessarily a Pareto-efficient equilibrium).

When the FX exposure of the non-financial private sector is high, policies to reduce it should be considered to ensure monetary policy could work effectively. The importance of FX debt in inhibiting central banks from allowing exchange rates to move freely implies that monetary policy could be overburdened by multiple goals. Our finding that FX debt financed from the domestic banking system seems to be more important for producing "fear of floating", suggests that policies should focus first, and mainly, on limiting the domestic FX lending. Such policies could include strengthening of supervision of FX lending by the domestic banking sector, prohibiting banks from taking excessive currency risks, higher reserve requirements for foreign currency funding, higher capital requirements and risk-weights on FX lending, and potentially outright quantity restrictions on banks' borrowing in foreign currency. More generalized capital flow management policies – while likely effective in reducing the overall FX exposures – would be less targeted and, thus, less effective in reducing the banking system FX lending.

As the choice of exchange rate regime and shifts between regimes may depend on the

level of FX indebtedness of corporates and households, the analysis could be extended to look at whether countries with high levels of balance sheet FX exposures are more likely to choose a fixed exchange rate regime. In addition, while we treat the decision of households and firms to borrow in FX as purely exogenous, policies to limit exchange rates movements may provide incentives for increased FX borrowing as explained by Chang and Velasco (2006). Emerging market economies may be diverging towards different equilibrium – with some on a suboptimal path of high and increasing FX borrowing and more exchange rate management, and others – on a path of low and declining FX borrowing and less exchange rate management. Studying this dual causality empirically would also be an interesting (yet challenging) extension.

Appendix

2.A List of countries

Baseline sample (15 emerging market economies):
Brazil, Chile, Colombia, Georgia, Hungary, Indonesia, Mexico, Peru, the Philippines, Poland, Romania, Russia, South Africa, Thailand, and Turkey.

2.B Data sources

Table 2.1: Definitions of variables and data sources

Variable	Unit	Description	Source
ΔReserves/GDP	%	Change in reserves minus gold normalized by annual GDP in USD	IMF International Financial Statistics (IFS), IMF World Economic Outlook (WEO)
ΔNFA/GDP	%	Change in central bank's net foreign assets normalized by annual GDP in USD	IFS, WEO
Policy rate	%	Money market rate	IMF statistical database, respective central banks
ΔNominal ER	%	Change in nominal bilateral exchange rate to USD (increase=depreciation)	IFS
ΔReal ER	%	Change in real bilateral exchange rate to USD (increase=depreciation)	IFS, Haver Analytics
ΔNEER	%	Change in nominal effective exchange rate (increase=depreciation)	BIS
ΔVIX	%	Change in Chicago Board Options Exchange Market Volatility index (VIX)	Haver Analytics
ΔEMBI	%	Change in Emerging markets bond index (EMBI)	Bloomberg
Inflation	%	Yearly inflation, computed from CPI	Haver Analytics
Output gap	%	Deviation from hp-trend of a real seasonally-adjusted GDP in national currency	WEO, author's calculations
FX debt/GDP	%	Foreign exchange debt of non-financial sector (households, enterprises) normalized by annual GDP in USD	Quarterly External Debt Statistics, IMF Monetary and Financial Statistics, WEO, author's calculations
Net open position of the banking system/GDP	%	Banks' FX liabilities minus assets normalized by annual GDP in USD	IMF Monetary and Financial Statistics, WEO
Government external debt/GDP	%	Government liabilities of the International Investment position normalized by annual GDP in USD	IFS, International Investment Position, WEO
Import coverage	%	Central bank's net foreign assets over yearly seasonally-adjusted imports	IFS, DOTS
Money coverage	%	Central bank's net foreign assets over M2	IFS, WEO
Current account balance/GDP	%	Four-quarter rolling current account balance normalized by annual GDP in USD	IFS, WEO
Trade openness/GDP	%	Seasonally-adjusted imports plus exports normalized by annual GDP in USD	DOTS, WEO
ΔM2/GDP	%	Change in seasonally-adjusted M2 normalized by annual GDP in national currency	IFS, WEO

Table 2.2: Summary statistics

Statistics	Obs.	Mean	SD	Min	Max
ΔReserves/GDP	2,250	0.002	0.007	-0.042	0.069
ΔNFA/GDP	2,250	0.002	0.007	-0.050	0.127
Policy rate	2,244	0.068	0.051	0.004	0.471
ΔNominal ER	2,250	0.001	0.036	-0.138	0.267
ΔReal ER	2,250	-0.001	0.036	-0.150	0.232
ΔNEER	2,250	0.001	0.023	-0.094	0.220
ΔVIX	2,250	-0.002	0.042	-0.102	0.309
ΔEMBI	2,250	0.000	0.110	-0.184	0.546
Inflation	2,250	0.054	0.038	-0.043	0.333
Output gap	2,245	-0.000	0.020	-0.115	0.093
FX debt/GDP	1,965	0.209	0.122	0.027	0.587
Net open position of the banking system/GDP	1,965	-0.013	0.041	-0.128	0.118
Government external debt/GDP	2,250	0.156	0.108	0.009	0.552
Import coverage	2,250	0.629	0.484	-0.214	2.702
Money coverage	2,250	0.394	0.252	-0.790	1.177
Trade openness/GDP	2,250	0.052	0.027	0.011	0.147
Current account balance/GDP	2,250	-0.020	0.051	-0.255	1.117
ΔM2/GDP	2,250	0.004	0.006	-0.024	0.132

2.C Figures

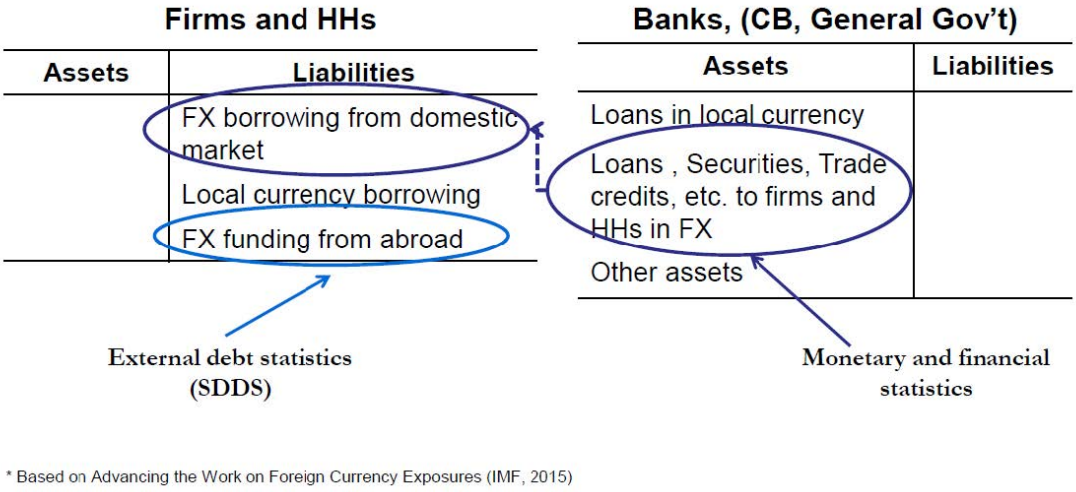


Figure 2.1: FX exposures of the non-financial private sector: schematic example

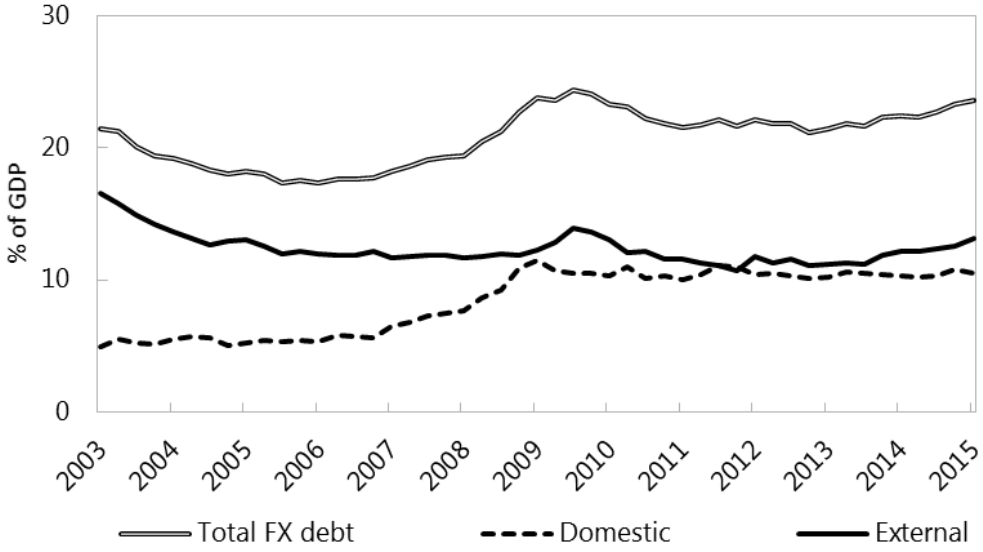


Figure 2.2: FX debt of the non-financial private sector across time
Source: Quarterly External Debt Statistics, IMF Monetary and Financial Statistics, WEO, authors' calculations.

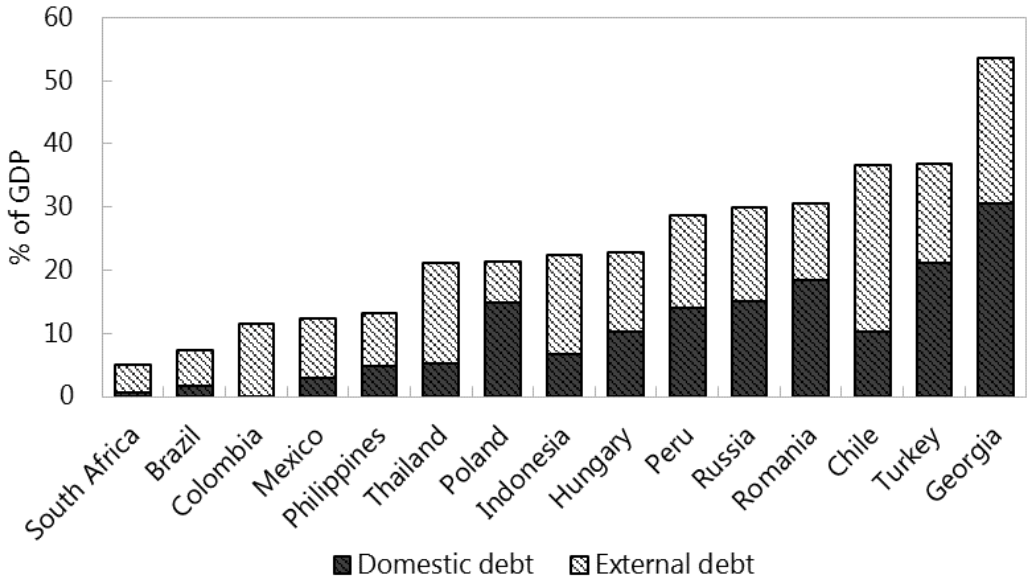
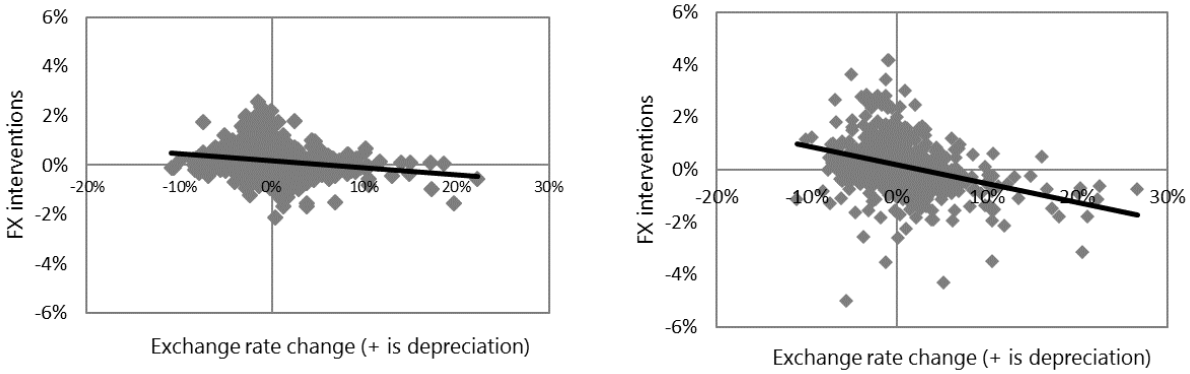


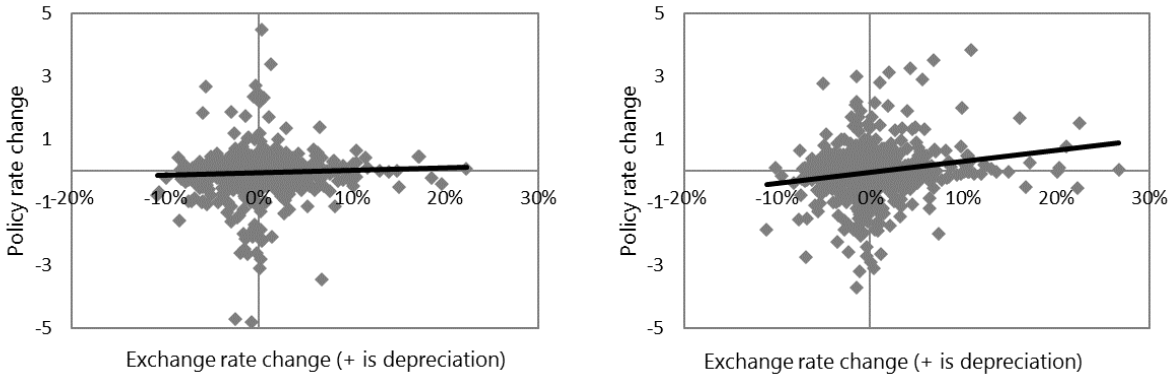
Figure 2.3: FX debt of the non-financial private sector across countries, Q12015
Source: Quarterly External Debt Statistics, IMF Monetary and Financial Statistics, WEO, authors' calculations.



(a) FX debt-to-GDP is lower than 20%

(b) FX debt-to-GDP is higher than 20%

Figure 2.4: Exchange rate changes and FX interventions



(a) FX debt-to-GDP is lower than 20%

(b) FX debt-to-GDP is higher than 20%

Figure 2.5: Exchange rate changes and policy rates

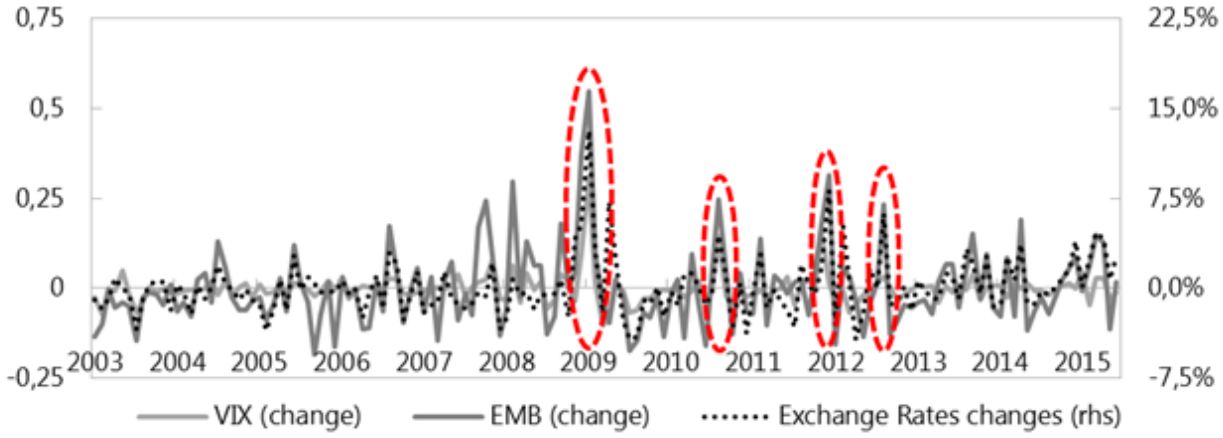


Figure 2.6: VIX, EMBI, and exchange rate changes

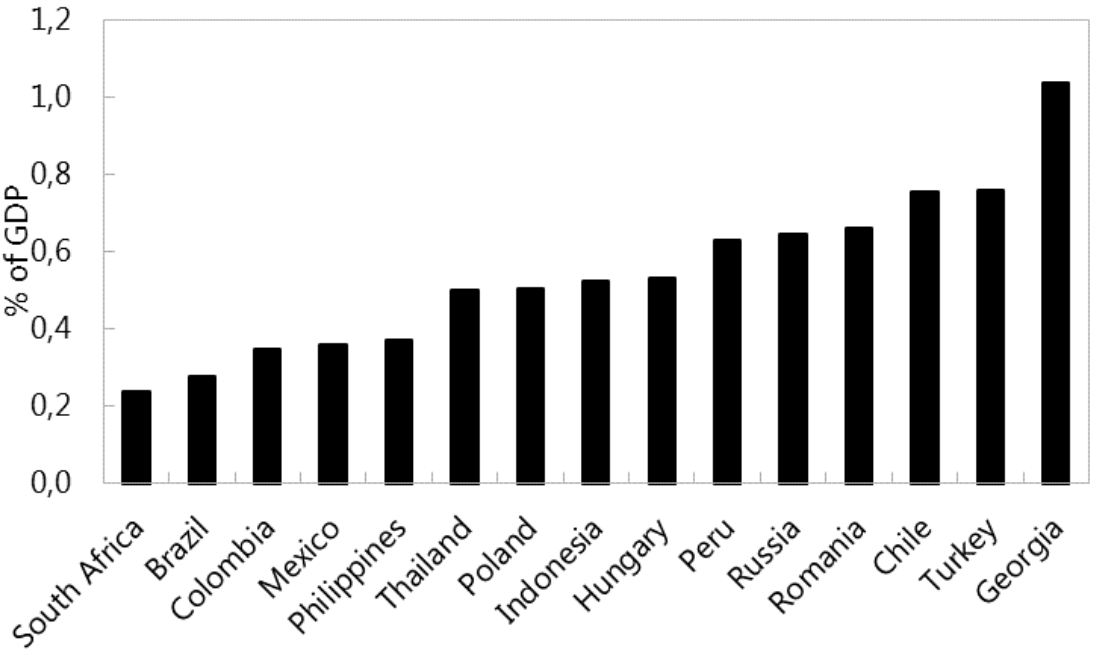


Figure 2.7: NFA decline associated with a 10% depreciation

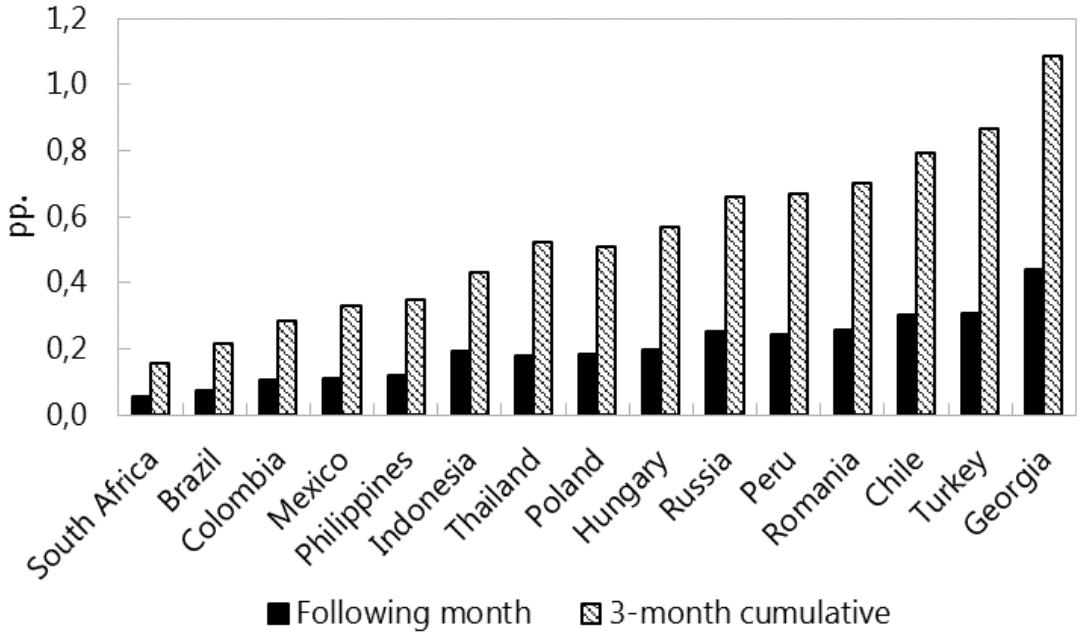


Figure 2.8: Policy rate increase associated with a 10% depreciation

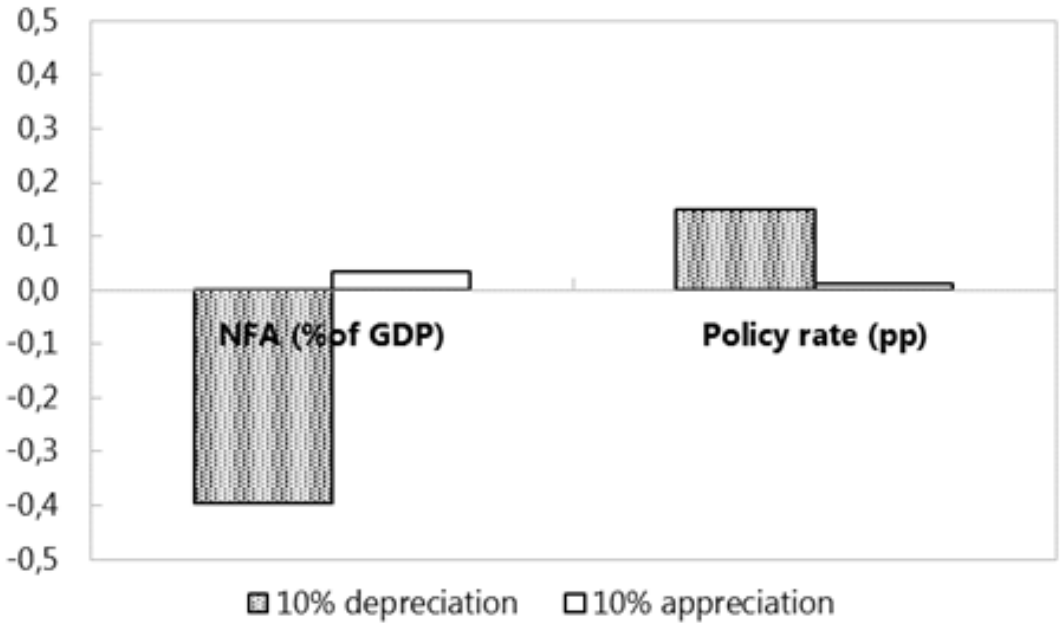


Figure 2.9: Appreciation vs. depreciation of exchange rates (FX debt: 10% of GDP)

2.D Tables

Table 2.3: Comparative statistics: high vs. low FX debt

	High FX debt (> 20% of GDP)	Low FX debt (< 20% of GDP)
% of cases	51	49
abs (ΔER) > 2.5%	36	35
abs (ΔPolicy rate) > 0.5 *pp.*	21	14
abs (ΔNFA/GDP) > 0.5%	38	21
Intervention index > 0.5	17	14

Note: $Int.index = \frac{(\Delta NFA/GDP)^2}{(\Delta NFA/GDP)^2+\Delta ER^2}$

Table 2.4: Regression results – FX interventions

	(1) OLS	(2) 2SLS
Δ Nominal ER	-0.015	-0.016
	(0.008)	(0.009)
Δ Nominal ER × Debt/GDP (lag)	-0.186***	-0.164***
	(0.033)	(0.042)
Δ Nominal ER (lag)	-0.014*	-0.015**
	(0.005)	(0.005)
Δ M2/GDP	0.128	0.124
	(0.072)	(0.073)
Trade openness/GDP	0.040	0.042
	(0.039)	(0.036)
Current acoount/GDP (lag)	0.032*	0.032*
	(0.014)	(0.014)
Money coverage (lag)	-0.006	-0.006
	(0.003)	(0.003)
Import coverage (lag)	0.002*	0.002*
	(0.001)	(0.001)
Debt/GDP (lag)	-0.004	-0.005
	(0.004)	(0.003)
Δ Debt/GDP	0.031**	0.029***
	(0.008)	(0.007)
N	1920	1920
R^2	0.157	0.157

*N*ote: The Table presents estimation results for FX interventions as a dependent variable. In 2SLS regressions, change in VIX is used as an instrumental variable for exchange rate changes. Country fixed effects are included in all regressions, but are not reported. White heteroskedasticity-robust standard errors in parentheses.

p<0.1*; p<0.05**; p<0.01***.

Table 2.5: Regression results – Policy rates

	(1) OLS	(2) 2SLS
Policy rate (lag)	Country-specific	
Inflation	Country-specific	
Output gap	Country-specific	
Δ Nominal ER (lag)	0.002	0.001
	(0.006)	(0.006)
Debt/GDP(lag)	-0.003	-0.003
	(0.003)	(0.002)
Δ Nominal ER (lag) $\times$ Debt/GDP(lag)	0.080***	0.080***
	(0.015)	(0.015)
Δ Nominal ER	0.020	0.023*
	(0.016)	(0.011)
N	1914	1914
R^2	0.962	0.962

*N*ote: The Table presents estimation results for policy rates as a dependent variable. In 2SLS regressions, change in VIX is used as an instrumental variable for exchange rate changes. Country fixed effects are included in all regressions, but are not reported. White heteroskedasticity-robust standard errors in parentheses.

p<0.1*; p<0.05**; p<0.01***.

Table 2.6: Regression results – FX interventions, external vs. internal borrowing

	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
Δ Nominal ER	-0.030*	-0.026**	-0.014	-0.026
	(0.011)	(0.010)	(0.017)	(0.017)
Δ Nominal ER ×	-0.262***	-0.298***		
Debt/GDP (internal, lag)	(0.044)	(0.065)		
Δ Nominal ER ×			-0.333	-0.166
Debt/GDP (external, lag)			(0.201)	(0.172)
Δ Nominal ER (lag)	-0.017**	-0.017**	-0.012*	-0.013*
	(0.005)	(0.005)	(0.005)	(0.005)
Δ M2/GDP	0.124	0.124	0.134	0.125
	(0.074)	(0.073)	(0.073)	(0.073)
Trade openness/GDP	0.040	0.038	0.043	0.045
	(0.037)	(0.035)	(0.038)	(0.037)
Current account/GDP (lag)	0.032*	0.033*	0.027	0.027*
	(0.014)	(0.013)	(0.014)	(0.013)
Money coverage (lag)	-0.005	-0.005	-0.006	-0.006
	(0.003)	(0.003)	(0.004)	(0.003)
Import coverage (lag)	0.002*	0.002*	0.002*	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
Debt/GDP (internal, lag)	-0.010	-0.010		
	(0.007)	(0.006)		
Δ Debt/GDP (internal)	0.067***	0.071***		
	(0.006)	(0.013)		
Debt/GDP (external, lag)			-0.002	-0.002
			(0.009)	(0.009)
Δ Debt/GDP (external)			0.018	0.018
			(0.014)	(0.013)
N	1920	1920	1920	1920
R^2	0.159	0.158	0.142	0.137

*N*ote: The Table presents estimation results for FX interventions as a dependent variable. In 2SLS regressions, change in VIX is used as an instrumental variable for exchange rate changes. Country fixed effects are included in all regressions, but are not reported. White heteroskedasticity-robust standard errors in parentheses.

p<0.1*; p<0.05**; p<0.01***.

Table 2.7: Regression results – Policy rates, external vs. internal borrowing

	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
Δ Nominal ER	0.020	0.023*	0.020	0.022*
	(0.016)	(0.011)	(0.016)	(0.010)
Δ Nominal ER (lag) ×	0.117***	0.118***		
Debt/GDP (internal, lag)	(0.025)	(0.025)		
Δ Nominal ER (lag) ×			0.088	0.087
Debt/GDP (external, lag)			(0.077)	(0.073)
Δ Nominal ER (lag)	0.007	0.007	0.009	0.009
	(0.007)	(0.007)	(0.010)	(0.009)
Debt/GDP (internal, lag)	-0.005	-0.005		
	(0.005)	(0.005)		
Debt/GDP (external, lag)			-0.002	-0.002
			(0.004)	(0.004)
N	1914	1914	1914	1914
R^2	0.962	0.962	0.962	0.962

*N*ote: The Table presents estimation results for policy rates as a dependent variable. In 2SLS regressions, change in VIX is used as an instrumental variable for exchange rate changes. Inflation, output gap and lagged policy rates are country-specific and are not reported. Country fixed effects are included in all regressions, but are not reported. White heteroskedasticity-robust standard errors in parentheses.

p<0.1*; p<0.05**; p<0.01***.

Table 2.8: Regression results – FX interventions, appreciation vs. depreciation of exchange rates

	(1) OLS	(2) 2SLS
ΔNominal ER	-0.015	-0.012
	(0.008)	(0.008)
ΔNominal ER x Debt/GDP (lag)	-0.217***	-0.280***
	(0.025)	(0.064)
ΔNominal ER x Debt/GDP (lag) x Dummy(ΔNominal ER <0)	0.099	0.361**
	(0.082)	(0.123)
ΔNominal ER(lag)	-0.014*	-0.014**
	(0.005)	(0.005)
Debt/GDP (lag)	-0.002	0.003
	(0.004)	(0.004)
Δ Debt/GDP	0.032**	0.030***
	(0.008)	(0.007)
ΔM2/GDP	0.126	0.112
	(0.071)	(0.072)
Trade openness/GDP	0.039	0.036
	(0.039)	(0.038)
Current account/GDP (lag)	0.031*	0.028*
	(0.014)	(0.014)
Money coverage (lag)	-0.006	-0.005
	(0.003)	(0.003)
Import coverage (lag)	0.002	0.001
	(0.001)	(0.001)
N	1920	1920
R^2	0.159	0.143

*N*ote: The Table presents estimation results for FX interventions as a dependent variable. In 2SLS regressions, change in VIX is used as an instrumental variable for exchange rate changes. Country fixed effects are included in all regressions, but are not reported. White heteroskedasticity-robust standard errors in parentheses.

p<0.1*; p<0.05**; p<0.01***.

Table 2.9: Regression results – Policy rates, appreciation vs. depreciation of exchange rates

	(1) OLS	(2) 2SLS
ΔNominal ER	0.020	0.024*
	(0.016)	(0.012)
ΔNominal ER (lag)	0.002	0.002
	(0.006)	(0.006)
ΔNominal ER (lag) x Debt/GDP (lag)	0.130***	0.130***
	(0.020)	(0.020)
ΔNominal ER (lag) x Debt/GDP (lag)	-0.162***	-0.161***
x Dummy (ΔNominal ER (lag) <0)	(0.033)	(0.034)
Debt/GDP (lag)	-0.006	-0.006
	(0.003)	(0.003)
N	1914	1914
R^2	0.962	

*N*ote: The Table presents estimation results for policy rates as a dependent variable. In 2SLS regressions, change in VIX is used as an instrumental variable for exchange rate changes. Inflation, output gap and lagged policy rates are country-specific and are not reported. Country fixed effects are included in all regressions, but are not reported. White heteroskedasticity-robust standard errors in parentheses.

p<0.1*; p<0.05**; p<0.01***.

Table 2.10: Regression results – FX interventions, alternative definitions of FX interventions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ΔNFA/GDP		ΔNFA/GDP(adj.)		ΔReserves/GDP		ΔNFA/M2	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Δ Nominal ER	-0.015	-0.016	-0.015	0.006	-0.006	-0.007	-0.037	-0.037
	(0.008)	(0.009)	(0.012)	(0.008)	(0.008)	(0.011)	(0.025)	(0.025)
Δ Nominal ER × Debt/GDP (lag)	-0.186***	-0.164***	-0.224***	-0.275***	-0.286***	-0.258***	-0.455***	-0.454**
	(0.033)	(0.042)	(0.040)	(0.044)	(0.031)	(0.069)	(0.093)	(0.150)
Δ Nominal ER (lag)	-0.014*	-0.015**	-0.025**	-0.026**	-0.011	-0.011	-0.043*	-0.043**
	(0.005)	(0.005)	(0.008)	(0.008)	(0.006)	(0.006)	(0.015)	(0.015)
Δ M2/GDP	0.128	0.124	0.090	0.085	0.134	0.129	0.468	0.467
	(0.072)	(0.073)	(0.086)	(0.088)	(0.065)	(0.068)	(0.263)	(0.263)
Trade openness/GDP	0.040	0.042	0.021	0.019	-0.008	-0.007	0.186	0.186
	(0.039)	(0.036)	(0.054)	(0.051)	(0.030)	(0.026)	(0.123)	(0.115)
Current account/GDP (lag)	0.032*	0.032*	0.034	0.035*	0.022	0.022	0.105*	0.105*
	(0.014)	(0.014)	(0.017)	(0.017)	(0.016)	(0.015)	(0.042)	(0.042)
Money coverage (lag)	-0.006	-0.006	-0.010	-0.010	-0.006	-0.006*	-0.017	-0.017
	(0.003)	(0.003)	(0.006)	(0.005)	(0.003)	(0.003)	(0.011)	(0.011)
Import coverage (lag)	0.002*	0.002*	0.004*	0.004*	0.003**	0.003**	0.004	0.004
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
Debt/GDP (lag)	-0.004	-0.005	0.002	0.001	0.000	-0.000	-0.030	-0.030
	(0.004)	(0.003)	(0.006)	(0.005)	(0.006)	(0.006)	(0.017)	(0.016)
Δ Debt/GDP	0.031**	0.029***	0.066	0.065	0.054**	0.051***	0.085**	0.085***
	(0.008)	(0.007)	(0.038)	(0.037)	(0.016)	(0.013)	(0.023)	(0.025)
N	1920	1920	1920	1920	1920	1920	1920	1920
R^2	0.157	0.157	0.139	0.136	0.201	0.200	0.113	0.113

*N*ote: The Table presents estimation results for FX interventions as a dependent variable. In 2SLS regressions, change in VIX is used as an instrumental variable for exchange rate changes. Country fixed effects are included in all regressions, but are not reported.White heteroskedasticity-robust standard errors in parentheses.

p<0.1*; p<0.05**; p<0.01***.

Table 2.11: Regression results – FX interventions, alternative definitions of exchange rates

	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS	(5) OLS	(6) 2SLS
Δ Nominal ER	-0.015	-0.016				
	(0.008)	(0.009)				
Δ Nominal ER × Debt/GDP (lag)	-0.186***	-0.164***				
	(0.033)	(0.042)				
Δ Nominal ER (lag)	-0.014*	-0.015**				
	(0.005)	(0.005)				
Δ Real ER			-0.015	-0.017		
			(0.009)	(0.009)		
Δ Real ER × Debt/GDP (lag)			-0.181***	-0.165***		
			(0.034)	(0.042)		
Δ Real ER (lag)			-0.016*	-0.016**		
			(0.005)	(0.005)		
Δ NEER					0.003	-0.015
					(0.009)	(0.010)
Δ NEER × Debt/GDP (lag)					-0.292***	-0.276*
					(0.068)	(0.108)
Δ NEER (lag)					-0.003	0.001
					(0.006)	(0.007)
Δ M2/GDP	0.128	0.124	0.129	0.127	0.099	0.105
	(0.072)	(0.073)	(0.073)	(0.074)	(0.069)	(0.068)
Trade openness/GDP	0.040	0.042	0.043	0.044	0.047	0.046
	(0.039)	(0.036)	(0.039)	(0.037)	(0.039)	(0.037)
Current account/GDP (lag)	0.032*	0.032*	0.033*	0.033*	0.033*	0.033*
	(0.014)	(0.014)	(0.014)	(0.014)	(0.015)	(0.014)
Money coverage (lag)	-0.006	-0.006	-0.006	-0.006*	-0.006	-0.006
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Import coverage (lag)	0.002*	0.002*	0.003*	0.003*	0.002	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Debt/GDP (lag)	-0.004	-0.005	-0.005	-0.005	-0.006	-0.006
	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)
Δ Debt/GDP	0.031**	0.029***	0.029**	0.028***	0.023*	0.025*
	(0.008)	(0.007)	(0.008)	(0.007)	(0.008)	(0.011)
N	1920	1920	1920	1920	1920	1920
R^2	0.157	0.157	0.154	0.153	0.083	0.080

*N*ote: The Table presents estimation results for FX interventions as a dependent variable. In 2SLS regressions, change in VIX is used as an instrumental variable for exchange rate changes. Country fixed effects are included in all regressions, but are not reported. White heteroskedasticity-robust standard errors in parentheses.

p<0.1*; p<0.05**; p<0.01***.

Table 2.12: Regression results – Policy rates, alternative definitions of exchange rates

	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS	(5) OLS	(6) 2SLS
Δ Nominal ER	0.020	0.023*				
	(0.016)	(0.011)				
Δ Nominal ER (lag) × Debt/GDP (lag)	0.080***	0.080***				
	(0.015)	(0.015)				
Δ Nominal ER (lag)	0.002	0.001				
	(0.006)	(0.006)				
Δ Real ER			0.018	0.022*		
			(0.015)	(0.011)		
Δ Real ER (lag) × Debt/GDP (lag)			0.079***	0.079***		
			(0.016)	(0.016)		
Δ Real ER (lag)			0.001	0.001		
			(0.005)	(0.005)		
Δ NEER					0.034	0.041**
					(0.018)	(0.014)
Δ NEER (lag) × Debt/GDP (lag)					0.218*	0.217**
					(0.080)	(0.077)
Δ NEER (lag)					-0.018	-0.020
					(0.015)	(0.015)
Debt/GDP (lag)	-0.003	-0.003	-0.003	-0.003	-0.002	-0.002
	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
N	1914	1914	1914	1914	1914	1914
R^2	0.962	0.962	0.962	0.962	0.962	0.962

*N*ote: The Table presents estimation results for policy rates as a dependent variable. In 2SLS regressions, change in VIX is used as an instrumental variable for exchange rate changes. Inflation, output gap and lagged policy rates are country-specific and are not reported. Country fixed effects are included in all regressions, but are not reported. White heteroskedasticity-robust standard errors in parentheses.

p<0.1*; p<0.05**; p<0.01***.

Table 2.13: Regression results – FX interventions, alternative instruments

	(1) OLS	(2) 2SLS	(3) 2SLS	(4) 2SLS
Δ Nominal ER	-0.015	-0.016	-0.019	-0.019
	(0.008)	(0.009)	(0.011)	(0.011)
Δ Nominal ER × Debt/GDP (lag)	-0.186***	-0.164***	-0.121**	-0.123**
	(0.033)	(0.042)	(0.044)	(0.044)
Δ Nominal ER (lag)	-0.014*	-0.015**	-0.015**	-0.015**
	(0.005)	(0.005)	(0.005)	(0.005)
Δ M2/GDP	0.128	0.124	0.117	0.117
	(0.072)	(0.073)	(0.073)	(0.073)
Trade openness/GDP	0.040	0.042	0.045	0.045
	(0.039)	(0.036)	(0.036)	(0.036)
Current account/GDP (lag)	0.032*	0.032*	0.032*	0.032*
	(0.014)	(0.014)	(0.013)	(0.013)
Money coverage (lag)	-0.006	-0.006	-0.006	-0.006
	(0.003)	(0.003)	(0.003)	(0.003)
Import coverage (lag)	0.002*	0.002*	0.002*	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
Debt/GDP (lag)	-0.004	-0.005	-0.005	-0.005
	(0.004)	(0.003)	(0.003)	(0.003)
Δ Debt/GDP	0.031**	0.029***	0.025***	0.026***
	(0.008)	(0.007)	(0.007)	(0.007)
Instrument		ΔVIX	ΔEMBI	ΔVIX, ΔEMBI
N	1920	1920	1920	1920
R^2	0.157	0.157	0.152	0.152
Test of overidentifying restrictions (χ^2-stat.)		13.693	19.877	38.807

Note: The Table presents estimation results for FX interventions as a dependent variable. Country fixed effects are included in all regressions, but are not reported. White heteroskedasticity-robust standard errors in parentheses. Test of overidentifying restrictions is a Wooldridge's test statistic. p<0.1*; p<0.05**; p<0.01***.

Table 2.14: Regression results – Policy rates, alternative instruments

	(1) OLS	(2) 2SLS	(3) 2SLS	(4) 2SLS
Δ Nominal ER	0.020	0.023*	0.017*	0.017*
	(0.016)	(0.011)	(0.007)	(0.007)
Δ Nominal ER (lag) × Debt/GDP (lag)	0.080***	0.080***	0.079***	0.079***
	(0.015)	(0.015)	(0.014)	(0.014)
Δ Nominal ER (lag)	0.002	0.001	0.002	0.002
	(0.006)	(0.006)	(0.006)	(0.006)
Debt/GDP (lag)	-0.003	-0.003	-0.003	-0.003
	(0.003)	(0.002)	(0.002)	(0.002)
Instrument		ΔVIX	ΔEMBI	ΔVIX, ΔEMBI
N	1914	1914	1914	1914
R^2	0.962	0.962	0.962	0.962
Test of overidentifying restrictions (χ^2-stat.)		10.832	16.649	39.714

*N*ote: The Table presents estimation results for policy rates as a dependent variable. Inflation, output gap and lagged policy rates are country-specific and are not reported. Country fixed effects are included in all regressions, but are not reported. White heteroskedasticity-robust standard errors in parentheses. Test of overidentifying restrictions is a Wooldridge's test statistic.
p<0.1*; p<0.05**; p<0.01***.

Table 2.15: Regression results – FX interventions, FX debt of banks and government

	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
Δ Nominal ER	-0.047**	-0.038***	-0.031	-0.026
	(0.012)	(0.009)	(0.018)	(0.015)
Δ Nominal ER ×	0.392*	0.180		
Debt/GDP (banks, lag)	(0.171)	(0.134)		
Δ Nominal ER ×			-0.140*	-0.100
Debt/GDP (government, lag)			(0.063)	(0.061)
Δ Nominal ER (lag)	-0.017**	-0.017**	-0.019**	-0.020**
	(0.005)	(0.005)	(0.006)	(0.006)
Δ M2/GDP	0.131	0.123	0.136	0.127
	(0.081)	(0.077)	(0.083)	(0.078)
Trade openness/GDP	0.045	0.049	0.032	0.035
	(0.029)	(0.028)	(0.032)	(0.030)
Current account/GDP (lag)	0.015	0.015	0.023	0.024*
	(0.011)	(0.011)	(0.012)	(0.012)
Money coverage (lag)	-0.000	-0.000	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Import coverage (lag)	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Debt/GDP (banks, lag)	-0.008	-0.007		
	(0.014)	(0.014)		
Δ Debt/GDP (banks)	0.008	0.012		
	(0.010)	(0.012)		
Debt/GDP (government, lag)			-0.004	-0.004
			(0.005)	(0.005)
Δ Debt/GDP (government)			0.031	0.039
			(0.020)	(0.020)
N	2202	2202	2205	2205
R^2	0.125	0.118	0.110	0.107

Note: The Table presents estimation results for FX interventions as a dependent variable. In 2SLS regressions, change in VIX is used as an instrumental variable for exchange rate changes. Country fixed effects are included in all regressions, but are not reported. White heteroskedasticity-robust standard errors in parentheses.

p<0.1*; p<0.05**; p<0.01***.

Table 2.16: Regression results – Policy rates, FX debt of banks and government

	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
Δ Nominal ER	0.019	0.022	0.019	0.021*
	(0.015)	(0.011)	(0.015)	(0.010)
Δ Nominal ER (lag) ×	0.040	0.036		
Debt/GDP (banks, lag)	(0.214)	(0.214)		
Δ Nominal ER (lag) ×			0.031	0.032
Debt/GDP (government, lag)			(0.038)	(0.036)
Δ Nominal ER (lag)	0.017	0.017	0.012	0.012
	(0.009)	(0.009)	(0.007)	(0.008)
Debt/GDP (banks, lag)	0.009	0.009		
	(0.008)	(0.008)		
Debt/GDP (government, lag)			0.000	0.000
			(0.007)	(0.007)
N	2189	2189	2192	2192
R^2	0.958	0.958	0.958	0.958

*N*ote: The Table presents estimation results for policy rates as a dependent variable. In 2SLS regressions, change in VIX is used as an instrumental variable for exchange rate changes. Inflation, output gap and lagged policy rates are country-specific and are not reported. Country fixed effects are included in all regressions, but are not reported. White heteroskedasticity-robust standard errors in parentheses.

p<0.1*; p<0.05**; p<0.01***.

Table 2.17: Regression results – FX interventions, non-linearities

	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
Δ Nominal ER	-0.008	0.000	-0.014	-0.019
	(0.008)	(0.014)	(0.011)	(0.016)
Δ Nominal ER × Debt/GDP (lag)	-0.264	-0.352	-0.190**	-0.152*
	(0.148)	(0.210)	(0.052)	(0.066)
Δ Nominal ER × (Debt/GDP)^2 (lag)	0.146	0.373		
	(0.270)	(0.370)		
Δ Nominal ER^2 × Debt/GDP (lag)			0.076	-0.027
			(0.320)	(0.316)
Δ Nominal ER^2			-0.016	-0.017
			(0.067)	(0.088)
Δ Nominal ER (lag)	-0.014*	-0.014**	-0.014*	-0.014**
	(0.005)	(0.005)	(0.005)	(0.005)
Δ M2/GDP	0.128	0.123	0.128	0.125
	(0.070)	(0.069)	(0.072)	(0.077)
Trade openness/GDP	0.039	0.041	0.041	0.042
	(0.040)	(0.038)	(0.038)	(0.037)
Current account/GDP (lag)	0.033*	0.033*	0.033*	0.032*
	(0.014)	(0.014)	(0.014)	(0.014)
Money coverage (lag)	-0.006	-0.006	-0.006	-0.006*
	(0.003)	(0.003)	(0.003)	(0.003)
Import coverage (lag)	0.003*	0.002**	0.002*	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
Debt/GDP (lag)	0.006	0.004	-0.005	-0.004
	(0.014)	(0.014)	(0.004)	(0.004)
Δ Debt/GDP	0.031**	0.028***	0.031**	0.030***
	(0.008)	(0.007)	(0.008)	(0.008)
(Debt/GDP)^2 (lag)	-0.016	-0.014		
	(0.020)	(0.020)		
N	1920	1920	1920	1920
R^2	0.158	0.156	0.157	0.156

*N*ote: The Table presents estimation results for FX interventions as a dependent variable. In 2SLS regressions, change in VIX is used as an instrumental variable for exchange rate changes. Country fixed effects are included in all regressions, but are not reported. White heteroskedasticity-robust standard errors in parentheses. p<0.1*; p<0.05**; p<0.01***.

Table 2.18: Regression results – Policy rates, non-linearities

	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
Δ Nominal ER	0.020	0.022*	0.020	0.024*
	(0.016)	(0.010)	(0.016)	(0.011)
Δ Nominal ER (lag) × Debt/GDP (lag)	0.142	0.138	0.029	0.029
	(0.158)	(0.155)	(0.024)	(0.023)
Δ Nominal ER (lag) × (Debt/GDP)^2 (lag)	-0.116	-0.110		
	(0.280)	(0.277)		
Δ Nominal ER^2 (lag) × Debt/GDP (lag)			0.765**	0.771**
			(0.242)	(0.242)
Δ Nominal ER (lag)	-0.004	-0.004	0.010	0.010
	(0.009)	(0.008)	(0.007)	(0.007)
Δ Nominal ER^2 (lag)			-0.141	-0.142
			(0.085)	(0.079)
Debt/GDP (lag)	-0.012	-0.012	-0.005	-0.005
	(0.016)	(0.016)	(0.004)	(0.003)
(Debt/GDP)^2 (lag)	0.014	0.014		
	(0.022)	(0.021)		
N	1914	1914	1914	1914
R^2	0.962	0.962	0.962	0.962

*N*ote: The Table presents estimation results for policy rates as a dependent variable. In 2SLS regressions, change in VIX is used as an instrumental variable for exchange rate changes. Inflation, output gap and lagged policy rates are country-specific and are not reported. Country fixed effects are included in all regressions, but are not reported. White heteroskedasticity-robust standard errors in parentheses.

p<0.1*; p<0.05**; p<0.01***.

Chapter 3

Legal Harmonization, Institutional Quality, and Countries' External Positions: A Sectoral Analysis[1]

3.1 Introduction

Regulators and policy makers are facing the challenge to promote resilient capital market structures that support macroeconomic and financial stability. The recent financial and sovereign debt crisis in Europe revealed a critical weakness: local stress was spreading across countries, such that the entire financial system became unstable. One reason for the system-wide stress is the financial market structure in Europe (Langfield and Pagano, 2016). Relative to GDP, the European Union (EU) has a large, though shrinking banking sector, and rather underdeveloped bond and equity markets comparative to the other big economies (Figure 3.1). Therefore, when the banking system ran into trouble, credit got scarcer in many countries, which impaired investment activity and, hence, growth. Consequently, policy makers and academics increasingly stress the role of alternative, non-bank financing sources for European firms.

The EU financial system remains national and cross-border financial integration is rather limited (European Commission, 2015). Even though international portfolio equity holdings have significantly increased since the global financial crisis, they remain relatively small as compared to portfolio debt holdings (Figure 3.2). The existing literature shows that a larger equity share in external positions is related to better cross-country risk

[1]This chapter is part of the "European capital markets and macroeconomic stability: The role of equity and debt" project. The chapter was previously published as: Bremus, F. and Kliatskova, T. (2018). Legal Harmonization, Institutional Quality, and Countries' External Positions: A Sectoral Analysis. *DIW Discussion Papers 1768*. DOI: `http://dx.doi.org/10.2139/ssrn.3287798`.

sharing, whereas larger external credit and debt positions matter less for consumption smoothing and can even reduce it (Kose et al., 2009; Milesi-Ferretti et al., 2011; Bremus and Buch, 2018). Related to these considerations, the key goals laid out in the Action Plan for the European Capital Markets Union (CMU) are the promotion of capital market integration in Europe and a further deepening of debt and equity markets.

In this paper, we analyze legal and institutional determinants of countries' external debt and equity positions for different sectors for a large sample of advanced economies, with a focus on the EU countries. Relating to the debate about the CMU, we ask how harmonization of the regulatory environment affects countries' external debt and equity positions, as well as whether cross-country differences in institutional efficiency matter for financial integration in Europe. The literature provides ample evidence that information frictions between countries due to differences in language and legal origins, along with deep-rooted preferences and habits, can explain a significant part of cross-border equity and debt holdings (Grinblatt and Keloharju, 2001; Giofre, 2013a; Roque and Cortez, 2014; Giofre, 2017). Yet, evidence on institutional and regulatory determinants of external financial structures in the EU is scarce. This paper fills this gap and investigates which institutional and regulatory factors that appear in the CMU-debate are relevant determinants of external holdings of equity and debt.

The channels through which European policymakers plan to deepen and integrate financial markets include standardization and harmonization of rules through supervisory convergence, elimination of differences in financial regulations between the EU countries, wider access to information, increased transparency (e.g. on the creditworthiness of firms), and convergence in tax and insolvency rules (European Commission, 2015).

First, we analyze the effect of legislative harmonization in the regulation of financial services on capital market integration. For that, we extend the legal harmonization index by Kalemli-Ozcan et al. (2010), using both the EU-Lex database and national information on the transposition of the EU-Directives in the area of financial intermediation. We collect data on the transposition of the EU laws by new member states as well as include information about the regulations introduced in the post-crisis period. A more harmonized legal framework reduces information and compliance costs and, therefore, should promote cross-border portfolio investment. Second, we investigate how cross-country differences in institutional variables, such as insolvency recovery rates, strength of investor protection, coverage of credit registries, as well as the efficiency of tax systems and contract laws, are related to international portfolio debt and equity investment. We expect that economic agents prefer to invest in countries with more efficient institutions.

We use bilateral data on external asset holdings for a set of the Organisation for Economic Co-operation and Development (OECD) and EU economies from the Coordinated

Portfolio Investment Survey (CPIS) by the IMF. As stressed by Galstyan et al. (2016), the patterns evident in the aggregate portfolio investment data do not uniformly apply across the various holding sectors. Therefore, in addition to total bilateral asset holdings, we use breakdowns of these positions by institutional sector of the holder in order to achieve a more granular picture about sectoral differences in the institutional and regulatory determinants of external portfolio holdings. We focus on private investors and consider three different institutional sectors, namely banks, other financial corporations (OFC), and the non-finanical private sector (NF) that includes non-financial corporations and households.

Our study is most closely related to two strands of literature. It contributes to the literature that studies the potential of legislative harmonization and convergence in institutional quality to promote international financial integration. While previous studies (Kalemli-Ozcan et al., 2010; Houston et al., 2012) look at the effect of regulatory harmonization on cross-border credit positions, our study provides evidence for portfolio debt and equity holdings, i.e. for capital market integration. Further, the paper is related to the gravity studies that analyze drivers of international investment positions at the *sectoral* level. Most of the gravity literature in finance is based on aggregate data on cross-border positions of debt and equity (Okawa and van Wincoop, 2012; Portes and Rey, 2005). Since data availability has improved, a small but growing literature investigates sectoral patterns of international investment positions (Roque and Cortez, 2014; Giofre, 2017; Galstyan et al., 2016; Boermans and Vermeulen, 2016). In contrast to the existing studies, we provide a comprehensive overview over the determinants of investment behavior of sophisticated (banks and other financial corporations) and less-sophisticated investors (households and non-financial corporations) in both equity and debt markets, with a focus on differences in institutional quality and regulatory environment.

Our empirical analysis yields three key findings. First, legislative harmonization in the regulation of financial services across the EU helps strengthen portfolio equity investment, while the effect is statistically insignificant for portfolio debt positions in our sample. Second, differences in institutional quality matter, particularly for bilateral cross-border debt positions. Economic agents prefer to invest more in countries that are transparent and have efficient insolvency procedures, investor protection, and tax systems as compared to the domestic ones. Third, the effects of legislative harmonization and differences in institutional efficiency on bilateral portfolio investment positions vary significantly across sectors. When we consider total holdings, important sectoral developments are hidden as they may counteract each other in the aggregate. The other financial corporations sector, which accounts for a large share of both portfolio equity and debt holdings, seems to incorporate information on institutional and regulatory factors in its investment decisions the most.

The rest of the paper is organized as follows. Section 3.2 provides a brief review of the literature. The empirical model together with hypotheses and data are presented in Section 3.3. Section 3.4 describes the estimation results and provides robustness tests. Section 3.5 concludes and offers thoughts on further research.

3.2 Literature review

Several empirical studies explore the effects of differences in financial regulations and institutional quality on cross-border portfolio investment and credit stocks and flows – with different results depending on whether bank credit or portfolio investment are considered.

One strand of the literature shows that differences in the stringency and quality of regulations can distort the allocation of capital between countries. On the one hand, cross-country differences in banking regulations may encourage bank credit to flow from more restrictive to less restrictive jurisdictions. This way, banks may improve their efficiency by reducing the costs of compliance with regulations. At the same time, this regulatory arbitrage can encourage excessive leveraging and risk taking (Barth et al., 2008). Houston et al. (2012) show that banks transfer funds to markets with more lenient regulations. However, countries with lax regulations but weak institutions are less able to attract credit inflows. In a similar vein, Bremus and Fratzscher (2015) find that source countries that experienced increases in capital stringency, banking supervisory power, or overall independence of the supervisor saw larger credit outflows after the global financial crisis.

On the other hand, in the case of cross-border debt and equity investments, economic agents have incentives to send capital to jurisdictions with more stringent rules on information sharing or investor protection, encouraging a "race to the top" in institutional quality (Carruthers and Lamoreaux, 2016). Based on an empirical analysis, La Porta et al. (2000) claim that the debt and equity capital markets of countries with poorer investor protections are both smaller and narrower. Mandatory disclosure and facilitation of private enforcement are positively associated with the ratio of equity market capitalization to GDP, the number of listed firms per capita, and trading volume relative to GDP (La Porta et al., 2006). Further, Gelos and Wei (2005) show that investment funds systematically invest less in less transparent countries and have a greater propensity to exit non-transparent countries during crises.

Another strand of the literature shows that countries with more similar regulations, both business and financial, face lower information barriers and lower costs of compliance, which leads to more bilateral cross-border investment (Okawa and van Wincoop, 2012). At the same time, regulatory differences impose additional costs on economic agents by making them learn, interpret, and understand different laws. For example, different ac-

counting standards make it more difficult for investors to evaluate the financial soundness and learn about the creditworthiness of firms they invest in. Empirically, Vlachos (2004) measures regulatory differences as the absolute difference between regulatory variables in the source and recipient countries of capital. His analysis confirms that smaller differences in financial regulations between two countries lead to higher bilateral portfolio holdings. He identifies the reduction in information costs rather than lower compliance costs as the key driving force of increased financial integration.

Kalemli-Ozcan et al. (2010) construct an index of legislative harmonization utilizing differences in the transposition of the EU-Directives of the Financial Services Action Plan (FSAP) into national laws by the EU-15. The paper presents evidence that legislative convergence led to growth in cross-border banking activities among the European countries. Ozkok (2016) collects a similar index for 25 EU countries and confirms a positive link between financial harmonization and developments in the banking and stock markets in the EU. Additionally, Christensen et al. (2016) find a positive effect of the Market Abuse Directive on market liquidity, with the effects being stronger in countries with stricter implementation and traditionally more stringent securities regulations.

3.3 Empirical analysis

The goal of this paper is to investigate how legal harmonization and cross-country differences in institutional quality impact cross-border investment in debt and equity markets. In the following, we present our hypotheses as well as describe the data and empirical methodology.

3.3.1 Hypotheses

We concentrate on institutional aspects that are related to the current debate about the European Capital Markets Union, namely legal harmonization and narrowing down of differences in investor protection, insolvency procedures, contract enforcement, credit information, and efficiency of tax systems. Table 3.3 summarizes the expected effects of the respective variables of interest on international portfolio investment. More generally, we test the following hypotheses.

Hypothesis 1: The more harmonized is the legal framework for financial services between countries i and j, the larger are their bilateral cross-border asset holdings. A more harmonized legal framework for financial services across countries lowers the costs of investing abroad. Legal harmonization reduces both information and compliance costs. Thus, we expect larger bilateral asset holdings for country-pairs with more harmonized markets

for financial services.

Hypothesis 2: Investors in country i invest more in assets issued by country j, if the quality of institutions in country j is better than in country i. In order to gauge the potential for more transparency (e.g. on the creditworthiness of firms) to foster capital market integration, we consider public and private coverage of credit registries. The better the access to information about firms' financial health is in the issuing country, the lower the information costs are and the more attractive cross-border investments become (La Porta et al., 2006). Hence, if the credit registry coverage in the issuer-country j is higher than in the holder-country i, investors from country i will prefer to hold more debt and equity from country j. Further, better investor protection (La Porta et al., 2000) and higher insolvency recovery rates raise the probability of receiving investments back in case of bankruptcy of the issuer. Thus, higher insolvency recovery rates in the issuer-country as compared to the holder-country should induce higher holdings by country i of assets issued by country j. The same reasoning applies to differences in investor protection. Finally, the larger the gap between country i and j in the costs to enforce a contract, that is, contract enforcement is less efficient in a source-country than in a recipient-country of capital, the higher should be the cross-border asset positions of i in j. A similar logic applies to the effect of differences in the time to prepare and pay taxes – a proxy for the efficiency of a tax system.

Given that sophisticated investors, such as banks and other financial corporations, are more exposed to cross-country differences in legal frameworks due to larger and more internationally diversified portfolios as compared to less-sophisticated investors (the non-financial private sector), we expect legal harmonization and institutional differences to matter more for the former sectors (Roque and Cortez, 2014).

Regarding asset classes, differences in the strength of insolvency recovery rates should be more important for debt than for equity investment due to the difference in liability characteristics of these two asset categories; in case of bankruptcy, creditors are generally paid first.[2] Regarding investor protection, empirical results by Giofre (2013b) reveal that a stronger protection of shareholders' rights can have opposing effects on equity and debt investments due to conflicting interests of creditors and shareholders, e.g. with respect to a firm's risk-taking. Overall, information asymmetries tend to matter more for shareholders (Eichler, 2012). Therefore, legal harmonization can be expected to play a more important role for portfolio equity than for portfolio debt investments.

[2]According to the WB Doing Business Indicators 2018, debt recovery rate was about 70 cents on the dollar in high-income OECD economies.

3.3.2 Data and summary statistics

Portfolio debt and equity holdings. We use bilateral sectoral cross-border portfolio equity and debt holdings as dependent variables. These variables capture security holdings by a sector s of country i that are issued by all sectors of country j. The data are available at annual frequency from the IMF CPIS, which collects information on the stock of cross-border portfolio equity and debt securities on a voluntary basis. We only consider holders from those OECD and EU countries that report international equity and debt holdings with a sectoral breakdown. For issuing countries, we include all OECD and EU countries for which the data are available. The full list of countries and a brief description of the key variables including the data sources can be found in Appendix 3.A-3.B. In order to prevent outliers from affecting the estimation results, we trim the sectoral debt and equity holdings at the 2.5%- and 97.5%-percentiles. Summary statistics for the regression sample are presented in Table 3.2.

As illustrated by Figure 3.2, which plots the evolution of total international debt and equity holdings for our baseline sample, investors from advanced economies hold more debt than equity. Holdings of both equity and debt followed an upward trend with equity and debt almost tripling over the 2001-2015 period. Equity holdings dropped significantly in 2008, which is partially due to valuation changes. Additionally, while average annual growth in both equity and debt holdings was negative in 2008 and 2011, portfolio equity holdings picked up again in the post-crisis period (Figure 3.3).

As stressed by Galstyan et al. (2016), the patterns evident in the aggregate portfolio investment data do not uniformly apply across the various holding sectors and may disguise important sectoral developments. Therefore, we disaggregate portfolio investments by sector of the holder, that is, into banks, other financial corporations (insurance corporations, pension funds, money market funds, and others), and the non-financial sector (private households and non-financial corporations). Monetary authorities and the public sector are excluded from the analysis.

We treat banks and other financial corporations as sophisticated investors that have greater experience in bond and equity investments and are more financially literate as compared to the less-sophisticated investors represented by non-financial corporations and households. As discussed by Roque and Cortez (2014), sophisticated investors face lower transaction and information costs and are more concerned about the profitability of their investment. Therefore, the importance of regulations in shaping investment decision might be different for sophisticated and less-sophisticated investors. Figure 3.4 plots the composition of international debt and equity holdings by sector for our regression sample. It reveals that recently OFCs account for the largest part of portfolio equity and debt hold-

ings. While banks hold a large part of external debt, their cross-border holdings of equity account for a minor share of total portfolio equity positions. The non-financial sector plays a subordinated role for portfolio investment positions in our sample.

Legislative harmonization. In order to investigate the role of legislative harmonization at the European market for financial services in promoting cross-border capital investments, we construct an index of legislative harmonization following Kalemli-Ozcan et al. (2010). These authors present a dataset that measures the degree of legislative harmonization in financial services across the EU-15 between 1999 and 2007. Their index is based on 27 EU-level Directives of the 1999 Financial Service Action Plan, which sought to create a harmonized European market for banking, securities, and insurance. To construct the index, Kalemli-Ozcan et al. (2010) exploit the fact that the Directives passed by the European Commission (EC) are transposed into national law within a certain period of time, often with delays. As shown by Koetter et al. (2017), the transposition time takes a couple of years and the delays might occur either due to necessity of technical adaptations and modifications of national laws and institutions or because of other more general country characteristics or political considerations. As the timing of the transposition of the EU-Directives varies across countries, the constructed index allows for capturing the harmonization of regulations across time and country-pairs. Besides measuring bilateral legal harmonization within the EU, this index could also be used as an instrument in studies evaluating the effects of financial openness as in Kalemli-Ozcan et al. (2013).

We update the index constructed by Kalemli-Ozcan et al. (2010) in two dimensions. First, we extend it to include the 13 new EU countries (Bulgaria, Czech Republic, Estonia, Croatia, Cyprus, Latvia, Lithuania, Hungary, Malta, Romania, Slovak Republic, Slovenia, and Poland), which transposed most of the existing Directives after their accession to the EU. Second, we collect information on the transposition dates of the financial regulations introduced post-crisis, which consist of 28 new Directives and amendments as described in Table 3.4. We select the Directives that are listed in the section "Financial reforms" by the European Commission.[3] Only the Directives related to banking, securities, or insurance markets that were transposed into national laws before 2015 are included. To find out the transposition dates of each Directive we rely on information from EUR-Lex as well as on the national legislation.[4]

To create the bilateral financial harmonization index, for each country-pair we define

[3] `https://ec.europa.eu/info/business-economy-euro/banking-and-finance/financial-reforms-and-their-progress/progress-financial-reforms_en`

[4] For each Directive, we search information on transposition dates at `https://eur-lex.europa.eu`, section "National transposition." For each country, this section presents a list of national laws that contain references to the Directive. We read the listed laws (available from the national law web-portals) and select those laws that mention transposition of the Directive into national law. The date is recorded as of entry of the law into force.

55 indicator variables (LEX_{kijt}) that are equal to one starting at the year when the Directive k was transposed into a national law by both countries, and zero otherwise. Further, we aggregate the values of the 55 indicator variables as follows: $LegHarm_{ijt} = log(1 + \sum_{k=1}^{K=55} LEX_{kijt})$. The resulting legal harmonization index takes higher values when countries i and j adopted similar regulations in the areas of banking, securities, and insurance. For example, in 2014, the non-logarithmized index is 34 for the country-pair Italy - Croatia, whereas it takes on a value of 50 for Netherlands - Sweden. Figure 3.5 confirms that the pace of transposition of the relevant EU-Directives into national laws varies across the EU member states. While some countries implemented the Directives quickly, others did not transpose some of the Directives into national laws or did it with delays. It is worth mentioning, that by construction the index is equal to zero for all country-pairs where at least one country is outside of th EU as, in this case, countries do not have any financial regulations in common.

Differences in institutional quality. To measure various aspects of legal barriers preventing capital market integration, we concentrate on specific legal areas that were identified by the Giovannini report (Giovannini Group, 2001). That is, we focus on variables gauging the quality of investor protection, insolvency recovery, contract enforcement, coverage of credit registries, and tax systems. We use time to prepare and pay taxes to account for the sophistication of a tax system (Lawless, 2013) and credit registry coverage to measure transparency of a financial system. Information on all these variables is taken from the WB Doing Business Indicators.

To measure differences in institutional quality between holder- and issuer-country, for each of the variables discussed above we compute indicators as follows: $InstDiff_{ijt} = log(Inst_{it}/Inst_{jt})$. Intuitively, economic agents are expected to transfer funds to markets with better regulations and more efficient legal frameworks (Table 3.3).

Control variables. In addition to our main variables of interest, we include a set of control variables in the regression equations. Following Okawa and van Wincoop (2012), we add standard bilateral gravity controls, such as common language, common legal origin, distance, bilateral trade, and membership in the EU and the euro area (EA). The lower distance between countries reduces communication costs and increases human interaction, thus, increasing cross-border investment between countries. The common language dummy captures information barriers that arise between two countries when economic agents speak different language and/or legal documents are in a different language. Similarly, countries that have the same legal origin (British, French, German, Scandinavian, or Socialist) face lower information barriers. More trade leads to closer interactions between countries reducing information asymmetries. Moreover, countries that are members of the EA do not face exchange rate risks, while membership in the EU removes potential capital movement

barriers. Following Houston et al. (2012), country-specific control variables for both holder- and issuer-economies include GDP per capita, population, and the Chinn-Ito index of financial liberalization.

3.3.3 Methodology

Our empirical model specification is based on the gravity literature in finance that links bilateral international capital positions to information frictions and country characteristics (Okawa and van Wincoop, 2012; Portes and Rey, 2005).

In a first step, we estimate how legal harmonization, that is, the applicability of the same laws across different countries, affects cross-border portfolio debt and equity holdings. Our aim is to gauge the potential for institutional harmonization – one of the long-term goals of the CMU – to foster cross-border integration of debt and equity markets. For this purpose, we estimate the following panel gravity model:

$$log(A_{i_sjt}) = \alpha_{it} + \theta_{jt} + \gamma LegHarm_{ijt} + \beta X_{ijt} + \epsilon_{i_sjt} \tag{3.1}$$

where A_{i_sjt} are portfolio asset positions (either equity or debt) held by investors in country i, issued by all entities in country j.

The index t denotes years, and s reflects the sector of the holder, namely banks, other financial corporations, and the non-financial private sector, as well as total bilateral portfolio positions.[5] $LegHarm_{ijt}$ gauges the harmonization of laws across the EU based on the transposition of the FSAP and post-FSAP Directives into national law as described above. Additionally, we include both constant and time-varying *bilateral* control variables from the gravity literature (X_{ijt}), such as common language, common legal origin, distance, bilateral trade, and dummy variables indicating whether both countries are members of the EU or the EA. To control for all country-specific pull and push factors, we add a full set of holder-country-and-time (α_{it}) and issuer-country-and-time fixed effects (θ_{jt}). These fixed effects absorb all banking sector and macroeconomic developments at the source- and recipient-country levels. Thus, all potential confounding factors at the country-level are controlled for in this setup.

Regarding concerns about a reverse causality between the legal harmonization index and capital market integration, we note that decisions on the transposition of Directives are made at the country-level and not at the bilateral level that our dependent variable is measured at. The transposition date of the related EU-Directives is decided upon by each

[5]Total bilateral positions include holdings of the public sector, which only accounts for a small part of total portfolio positions. It is not included separately in the analysis, as our focus is on the link between institutional differences and private investment behavior. Moreover, data coverage for public portfolio holdings is rather limited.

individual country and affects all its EU-partner countries alike. Further, Koetter et al. (2017) show that transposition delays are mainly related to the prevailing country-specific legal and regulatory frameworks rather than to financial structures. Still, more financially integrated economies may implement the Directives faster. This pattern, however, will be controlled for by the country-and-time fixed effects for holder- and issuer-countries.

In a second step, we explore how differences in the quality of institutions between holder- and issuer-countries affect the investment behavior of different sectors. The idea is that economic agents prefer to invest more in countries that are transparent and that have high quality of institutions and laws as compared to the national ones. We follow Houston et al. (2012) and regress bilateral asset holdings on the differences between several measures of institutional efficiency in countries i and j:

$$log(A_{i_sjt}) = \alpha_i + \theta_j + \eta_t + \gamma InstDiff_{ijt} + \beta X_{ijt} + \epsilon_{i_sjt} \tag{3.2}$$

where $InstDiff_{ijt}$ contains the variables of interest, which capture how qualitatively different institutions and laws between two countries are. We concentrate on institutional characteristics related to the CMU-debate, such as investor protection, disclosure of information, contract law, and insolvency and tax regimes. The vector X_{ijt} contains the same bilateral control variables as in equation (3.1). Additionally, we include a set of standard country-level control variables as in Houston et al. (2012), namely log of GDP per capita, log of population, and the Chinn-Ito index of financial liberalization for both holder- and the issuer-countries.

Overall, our baseline sample covers 33 holder- and 35 issuer-countries over the period of 2001-2015. For the models investigating the impact of differences in institutional efficiency (equation (3.2)), the sample covers the years 2006-2014, as the main explanatory variables measuring the quality of institutions from the WB Doing Business Indicators are only available for this period. As we are interested in how institutional differences and legal harmonization within the EU affect capital market integration, we follow Kalemli-Ozcan et al. (2010) and only include those holder- and issuer-countries from the EU and the OECD countries that report international equity and debt holdings with a sectoral breakdown. For robustness checks, we expand our sample to all 94 issuer-economies for which the data are available.

3.4 Empirical results

Tables 3.5 - 3.9 present estimation results for the linkages between bilateral portfolio holdings, legal harmonization, and institutional efficiency, based on equations (3.1) and

(3.2). We provide detailed evidence for total bilateral debt and equity positions together with sectoral decompositions into banks, other financial corporations (OFC), and the non-financial private sector (NF).

3.4.1 Determinants of international debt and equity positions

Legislative harmonization. Table 3.5 presents the results for our baseline sample of advanced economies. It appears that harmonization of the financial market regulations within the EU is positively related to cross-border debt and equity positions. Yet, the positive effect of bilateral legal harmonization is only statistically significant for the cross-border portfolio equity holdings of the other financial corporations sector (column (7)). The result remains intact if the sample is extended to a broader set of countries (Table 3.6). Hence, legal harmonization seems to matter more for equity market integration, which may be due to shareholders' higher sensitivity to information frictions as compared to creditors. The non-results for the banking sector may be partly driven by comparatively small volumes of portfolio equity holdings by banks.

In order to investigate whether the estimation results are driven by certain domains of financial market regulations, we run regressions for four alternative measures, namely for bilateral harmonization in the areas of (1) banking, (2) securities, (3) insurance services, and (4) focusing on newly issued Directives, excluding amendments to the previous Directives, as shown in Table 3.4. All regressions include the same number of observations as well as the same control variables as in the baseline setup in Table 3.5. Based on the results in Table 3.7, all sub-indexes (banking, securities, insurance services) are statistically significant in the regressions with portfolio equity investment of the other financial corporations as a dependent variable, with harmonization in the insurances area being particularly important.

Regarding economic significance, an increase in harmonization of financial regulations between issuer- and holder-countries by one standard deviation from the mean is associated with an increase in cross-border equity holdings of the other financial corporations by 34%.[6] As we control for membership in the EA and in the EU, the coefficients on our bilateral harmonization index show the effect of the adoption of common laws on cross-border capital market integration on top of the membership effect. When comparing this effect to the impact of changes in other structural variables, we find that, for example, an increase in bilateral trade by one standard deviation from the mean corresponds to a rise in bilateral portfolio equity holdings of the other financial corporations by about 90%. Hence,

[6]Taking the estimated coefficient from Table 3.5 (column (7)) and multiplying it with a one standard deviation increase from the mean (in %) in the (non-logarithmized) index of legal harmonization yields $0.28 \times 100 \times (17.8/14.7) = 34.2\%$.

pushing forward legal harmonization can strengthen equity market integration within the EU, thereby increasing financial market depth.

For the set of standard bilateral control variables, our estimation results confirm previous evidence from the gravity literature. The less distant two countries are and the more they trade with each other, the larger are their bilateral portfolio debt and equity positions. Moreover, legal origins are an important determinant of capital market integration; bilateral portfolio positions are higher if two countries share a common legal system. These findings are broadly confirmed across assets types (debt, equity) and sectors (total, banks, OFC, NF).

For total cross-border debt assets, our results reveal that positions are higher within the euro area as compared to the rest of the sample; i.e. if both holder- and issuer-countries are members of the euro area. This finding is driven by the asset holdings of the euro area financial sector, whereas debt holdings do not significantly differ inside and outside of the euro area for the non-financial sector. Higher portfolio debt holdings within the euro area are related to comparatively large banking systems, both on the issuer- and holder-sides. As banks are closely interlinked with each other by holding other banks' bonds and they re-finance themselves through debt more than through equity, the obtained results are not surprising.

Bilateral equity positions, in contrast, do not show a consistently different pattern within the euro area as compared to the rest of the sample. Apart from a positive and significant effect of euro area membership on bilateral equity positions in the banking sector, euro area membership does not seem to matter for portfolio equity investment. The regression results are in line with the fact that European economies differ in their investment patterns from a broader set of countries (Langfield and Pagano, 2016).

Differences in institutional quality. Next, we investigate how differences in the quality of institutions between holder- and issuer-countries affect bilateral debt and equity holdings (Tables 3.8 - 3.9). As expected, capital is attracted by those countries featuring the more efficient institutional frameworks, even when controlling for general bilateral information frictions like common legal origins or distance.

First, the larger is the difference between two countries in strength of investor protection, insolvency recovery, and credit registry coverage, that is, the issuer-country has less efficient institutions as compared to the holder-country, the lower are their bilateral portfolio debt positions. Second, the less time it takes to enforce a contract and to prepare and pay taxes in the issuer-country than in the holder-country, the more investors from country i invest in debt instruments of country j. The coefficients are rather similar for both the sample of advanced countries (Table 3.8) and the extended country sample (Table 3.9). Interestingly, it is again the sector of the other financial corporations that mostly

drives the results, but this time with respect to its portfolio debt holdings.

The estimates indicate that a change in the ratio of institutional quality in the holder- and issuer-country by one standard deviation from the mean translates into a change in portfolio debt holdings of the other financial corporations by about 30 - 60%, depending on the type of laws being adjusted. For example, if insolvency recovery rates become more favorable in the holder- than in the issuer-country, such that the difference in institutional quality rises, cross-border debt holdings of the other financial corporations fall by nearly 30% on average. At the same time, differences in institutional efficiency do not seem to matter much for bilateral portfolio equity investments across sectors and in total. For insolvency recovery rates, for example, this finding is in line with the pecking order of priority creditor payments, according to which holders of securities are paid before equity shareholders in case of the liquidation of a company.

As suggested by Tables 3.10 - 3.11 in the Appendix, both institutional pull and push factors play an important role in determining investment decisions – yet, mostly in debt markets in our sample. Economic agents from countries with high quality of institutions (especially, in the areas of investors protection and insolvency laws) invest less abroad. At the same time, investments go to the issuer-countries with better institutional quality.

3.4.2 Robustness checks

Next, we explore the sensitivity of our results to sample selection, potential outliers, and changes in the model specification.[7]

First, we check how robust our regression results are to changes in the sample composition. For that goal, we test if the observed effects are driven by individual countries or groups of countries. We exclude issuer- and holder-countries one-by-one. The coefficients of interest retain their economic and statistical significance for all specifications. Further, in order to account for potentially different dynamics of equity and bond markets pre- and post-crisis, we re-run the regressions excluding years one-by-one as well as removing the global financial crisis from the sample. The results remain close to our baseline specification.

Second, to test for the robustness of our results with respect to the choice of the dependent variable, we use the log of the share of country j's assets in the total external portfolio of country i (Roque and Cortez, 2014). The results are mostly unaffected by this alternative specification. In addition, we check sensitivity of our estimates to the model specification with respect to the explanatory variables. We exclude each explanatory

[7]The corresponding regression results are not reported and are available upon request.

variable one-by-one to account for potential multicollinearity between the regressors.[8] As expected, institutional and regulatory variables are correlated and the coefficients become more statistically significant when we include only one explanatory variable at a time.

Third, we test the sensitivity of our coefficients of interest, namely the coefficients on legal harmonization, with respect to the inclusion of different combinations and sets of control variables. Given that point estimates and standard errors depend on model specification (Athey and Imbens, 2015), in addition to the aforementioned robustness checks, we take a more systematic approach. Namely, we perform an extreme bounds analysis (EBA) using the Sala-i-Martin algorithm that considers the entire distribution of the parameters (Hlavac, 2016). It estimates 2^m regressions using different combinations of m potential explanatory variables.[9] This approach allows for checking whether changes in the set of explanatory variables can fundamentally change the coefficients of interest. The results of the EBA are presented in Figures 3.6 - 3.7. They suggest that the coefficients on legal harmonization are mostly positive for both total debt and equity holdings across a large range of alternative empirical models. Moreover, legal harmonization is positively associated with debt and equity holdings of the OFCs and portfolio debt investment of banks. Yet, the estimated coefficients on legal harmonization for the portfolio equity positions of the non-financial corporations and banks are varying widely and can take positive and negative values almost equally likely, depending on the set of the included control variables.

Finally, we consider various approaches for estimating the standard errors in our panel data regressions. Apart from clustering standard errors at a holder-country level, we perform clustering at both issuer-country and country-pair levels. The results become more statistically significant with alternative clustering methods.

3.5 Conclusion and outlook

Motivated by the debate about institutional harmonization in the realm of the Action Plan for the European Capital Markets Union, this paper analyzes institutional and regulatory driving factors of bilateral cross-border debt and equity holdings at the sectoral level. The goal is to examine the potential for institutional harmonization to affect longer-term structures of the financial system in Europe. To this end, based on the information from the European Commission and national sources, we extend the legal harmonization index

[8] Our baseline model is specified such that variance inflation factors are below the recommended value of 10.

[9] We use $m = 10$ potential explanatory variables: common language, common legal origin, colonial links, common colony, common currency, contiguity, log distance, log trade, and membership in the EU and euro area. Consequently, 1024 regressions are estimated.

proposed by Kalemli-Ozcan et al. (2010) by collecting data on the transposition of the 28 post-FSAP Directives as well as by including new EU member states in the sample. Besides allowing to gauge *de jure* capital market integration in Europe, this index could also be used as an instrument in studies evaluating the effects of capital market integration, similarly to the approach of Kalemli-Ozcan et al. (2013) for banking sector integration.

Our empirical analysis yields three key findings. First, based on the constructed measure of legal harmonization of financial regulations for the 2001-2015 period, we present evidence that common laws in financial services facilitate cross-border capital market integration, providing support for Hypothesis 1. The regression results reveal that the other financial corporations sector increases its cross-border portfolio equity investment in response to legal harmonization. In contrast, portfolio debt holdings are not significantly affected by harmonization of the regulatory environment.

Second, we find evidence that supports Hypothesis 2, i.e. differences in institutional quality matter for cross-border asset holdings as economic agents prefer to invest in countries with more efficient institutions as compared to the domestic ones. The more efficient insolvency procedures, investor protection, or contract enforcement are in an issuer-country as compared to a holder-country, the larger are the bilateral portfolio debt positions. Portfolio equity holdings, however, seem to be less responsive to these discrepancies.

Third, the estimation results show that the relationship between institutional and regulatory differences and bilateral portfolio investment holdings vary significantly across sectors. The other financial corporations sector reacts to a large set of the variables considered in this study as compared to banks and the non-financial private sector. Given that the sector of the OFCs accounts for a significant part of the cross-border debt and equity positions, the reduction of differences in institutional quality as well as legal harmonization of the financial regulations have the potential to increase capital market integration.

Since most of the indicators on differences in institutional quality are rather broad and reflect a large set of factors, a more detailed analysis of the most relevant regulatory and institutional drivers of the external capital market positions is needed. Further, in order to examine the potential for legal harmonization and more efficient institutions to promote equity market integration, the analysis could be extended to foreign direct investment as an important part of the equity market.

Appendix

3.A List of countries

Holder-countries (33 EU and/or OECD countries):
Australia, Austria, Belgium, Bulgaria, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Mexico, Netherlands, Norway, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, Turkey, and United Kingdom.

Issuer-countries (35 OECD countries):
Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States.

Full sample (59 additional issuer-countries):
Argentina, Bahamas, Bahrain, Barbados, Belize, Bermuda, Brazil, Bulgaria, China, Colombia, Costa Rica, Cote d'Ivoire, Croatia, Cyprus, Dominican Republic, Ecuador, Egypt, El Salvador, Georgia, Ghana, Gibraltar, Guatemala, Hong Kong, India, Indonesia, Jamaica, Jordan, Kazakhstan, Kenya, Kuwait, Lebanon, Liberia, Lithuania, Malaysia, Malta, Mauritius, Morocco, Nigeria, Oman, Pakistan, Panama, Papua New Guinea, Peru, Philippines, Qatar, Romania, Russia, Saudi Arabia, Singapore, South Africa, Sri Lanka, Thailand, Trinidad and Tobago, Tunisia, Ukraine, United Arab Emirates, Uruguay, Venezuela, and Vietnam.

3.B Data sources

Table 3.1: Definitions of variables and data sources

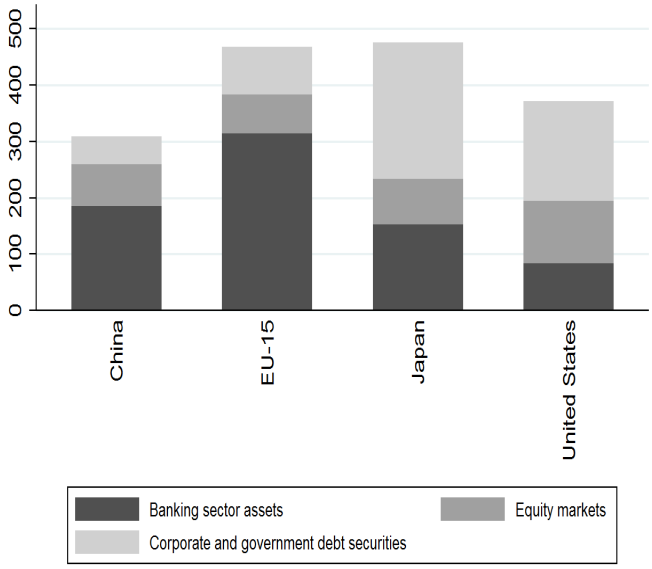
Variable	Unit	Description	Source
Equity, Debt	mln. USD	Cross-border holdings of equity or debt from a country j by sectors of a country i	CPIS, IMF
Common language	0 or 1	Dummy variable that equals one if the two countries share a common language (spoken by at least 9% of the population in both countries)	CEPII
Common legal origin	0 or 1	Dummy variable that equals one if the two countries have the same legal origin (British, French, German, Scandinavian, and Socialist)	La Porta et al. (1999)
Distance	km	Simple distance between most populated cities	CEPII
Trade	mln. USD	Sum of the values of imports and exports, FOB	DOTS, IMF
EU, EA	0 or 1	Dummy variables that equals one if the two countries are members of the EU and euro area, respectively	
GDP per capita	const. 2010 mln. USD	GDP per capita	World Development Indicators, WB
Population	mln. people	Total population that is counted as all residents regardless of legal status or citizenship (mid-year estimates)	Global Financial Development, WB
Fin. liberalization	[0,1]	The Chinn-Ito index, normalized. The more open the country is to cross-border capital transactions, the higher values the index takes	Chinn and Ito (2006)
Insolvency recovery	cents on the dollar	Amount recovered by secured creditors through judicial reorganization, liquidation or debt enforcement (foreclosure or receivership) proceedings	WB Doing Business
Strength of inv. protection	[0,10]	Strength of investor protection index. High values indicate better protection	WB Doing Business
Time to enforce a contract	days	Time required to enforce a contract, counted from the moment the plaintiff decides to file the lawsuit in court until payment	WB Doing Business
Time to pay taxes	hours	Time to prepare and pay taxes (per year) for a medium-size company	WB Doing Business
Credit registry coverage	%	Public and private credit registry coverage	WB Doing Business
Bilateral harmonization index	index	Legislative harmonization in financial services based on the transposition of the EU-Directives	EC, Kalemli-Ozcan et al. (2010), authors' calculations

Table 3.2: Summary statistics

	Obs.	Mean	SD	Min	Max
	Dependent variables				
log(Debt), total	11,750	5.71	2.95	-1.84	11.06
log(Debt), banks	7,043	5.46	2.61	-1.17	10.38
log(Debt), OFC	7,868	5.37	2.82	-1.31	10.62
log(Debt), NF	6,465	3.28	2.81	-3.33	9.06
log(Equity), total	11,490	4.70	3.32	-3.92	10.41
log(Equity), banks	4,178	3.38	2.85	-3.81	8.66
log(Equity), OFC	7,992	4.77	3.03	-2.74	10.11
log(Equity), NF	6,862	2.73	3.14	-4.99	8.52
	Bilateral explanatory variables				
Common language	11,750	0.07	0.25	0.00	1.00
Common legal origin	11,750	0.20	0.40	0.00	1.00
log(Distance)	11,750	7.78	1.13	4.09	9.88
log(Trade)	11,750	7.37	2.03	-1.61	13.36
Both countries in the EU	11,750	0.45	0.50	0.00	1.00
Both countries in the EA	11,750	0.17	0.38	0.00	1.00
Bilateral harmonization index, total	11,750	1.45	1.67	0.00	3.99
	Country-specific explanatory variables				
Strength of inv. protection, diff.	6,377	0.00	0.31	-1.08	1.06
Insolvency recovery, diff.	6,377	-0.02	0.57	-1.59	1.59
Time to enforce a contract, diff.	6,377	0.02	0.58	-1.75	1.79
Credit coverage, diff.	6,377	-0.01	1.14	-3.96	3.96
Time to pay taxes, diff.	6,377	0.08	0.71	-2.30	2.49
log(GDP per capita), issuer	6,377	11.29	2.06	7.22	17.16
log(Population), issuer	6,377	2.57	1.33	-1.19	5.77
Financial liberalization, issuer	6,377	0.90	0.21	0.16	1.00
log(GDP per capita), holder	6,377	11.21	2.10	7.22	17.16
log(Population), holder	6,377	2.42	1.23	-1.19	4.87
Financial liberalization, holder	6,377	0.91	0.17	0.16	1.00

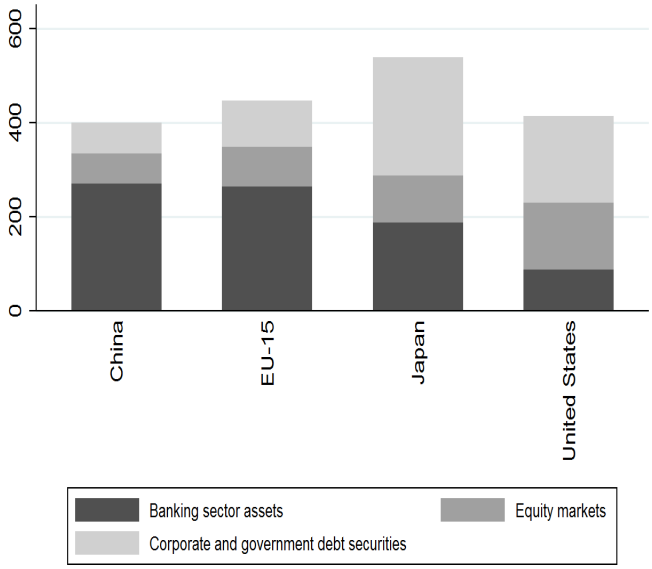
Note: This Table presents descriptive statistics for the baseline regressions presented in Tables 3.5 and 3.8. OFC = other financial corporations (insurances, pension funds, money market funds, others), NF = non-financial private sector (non-financial corporations and private households), diff. = log of the ratio of institutional quality in the holder- and issuer-country.

3.C Figures



Source: Author's calculations based on the IMF IFS, GFDD WB, BIS Debt securities statistics, European Central Bank, Bank of Japan, China Banking Regulatory Commission, Board of Governors of the FED, Securities Industry and Financial Markets Association

(a) 2008



Source: Author's calculations based on the IMF IFS, GFDD WB, BIS Debt securities statistics, European Central Bank, Bank of Japan, China Banking Regulatory Commission, Board of Governors of the FED, Securities Industry and Financial Markets Association

(b) 2015

Figure 3.1: Size of the financial sector (% of GDP)

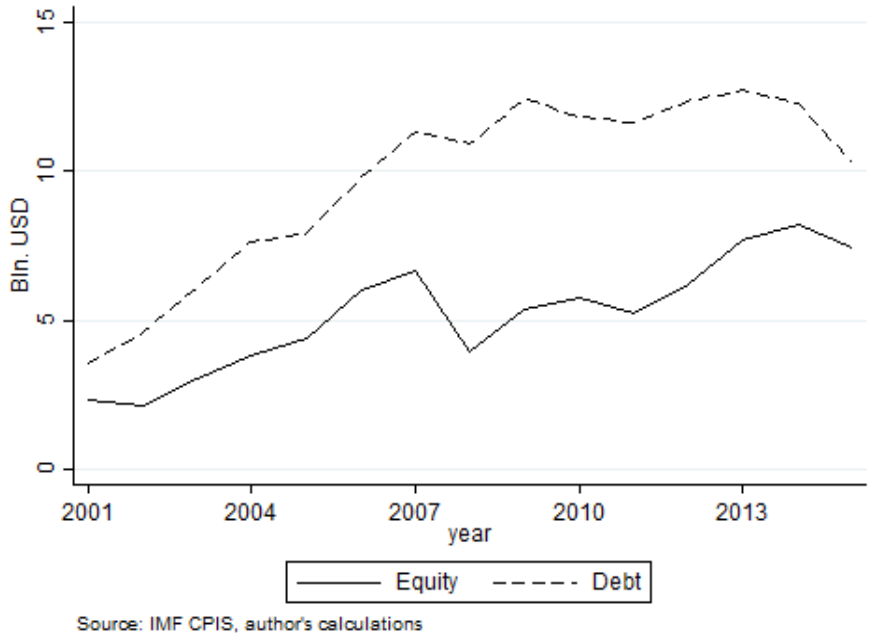


Figure 3.2: Mean growth rates of international portfolio debt and equity holdings

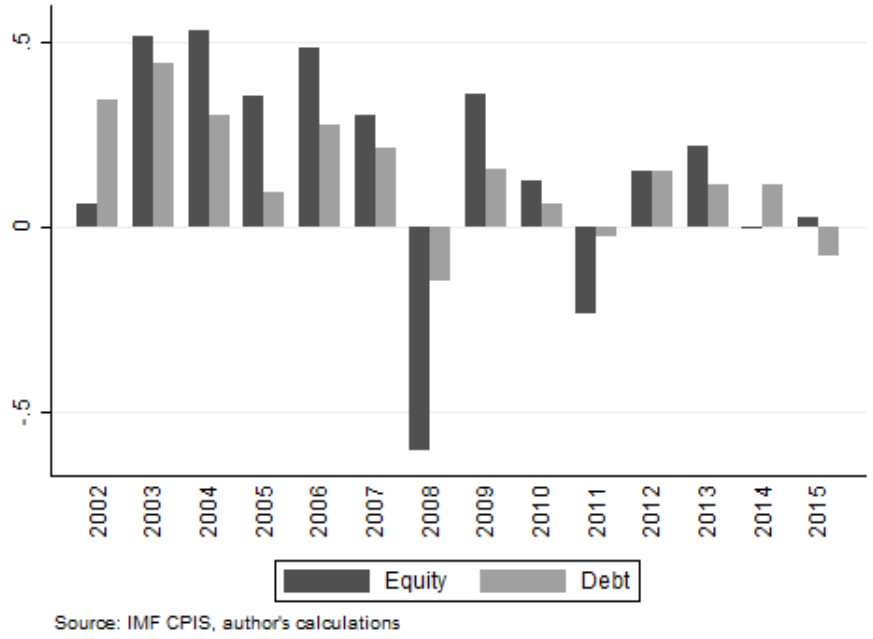
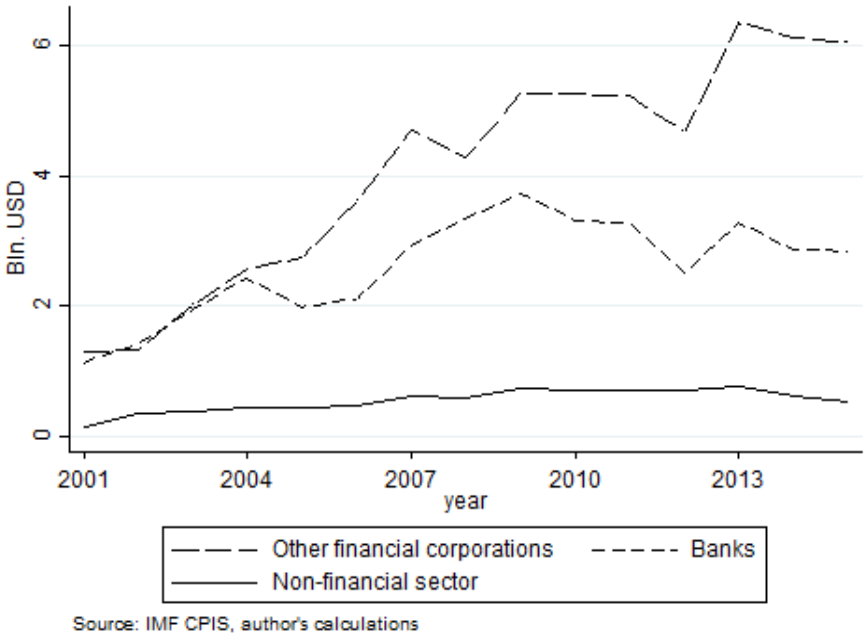
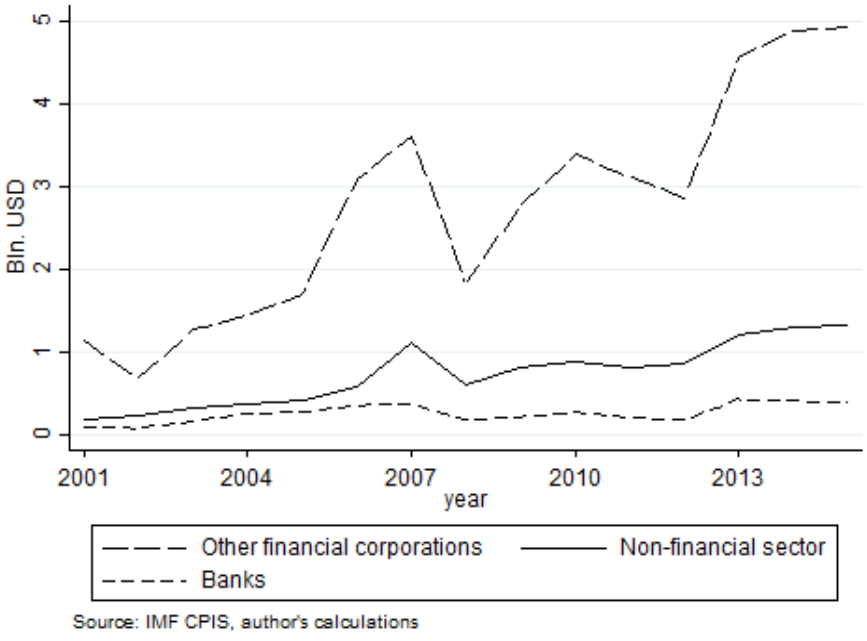


Figure 3.3: Total international portfolio debt and equity holdings



(a) Portfolio debt holdings



(b) Portfolio equity holdings

Figure 3.4: Cross-border portfolio positions, by sector

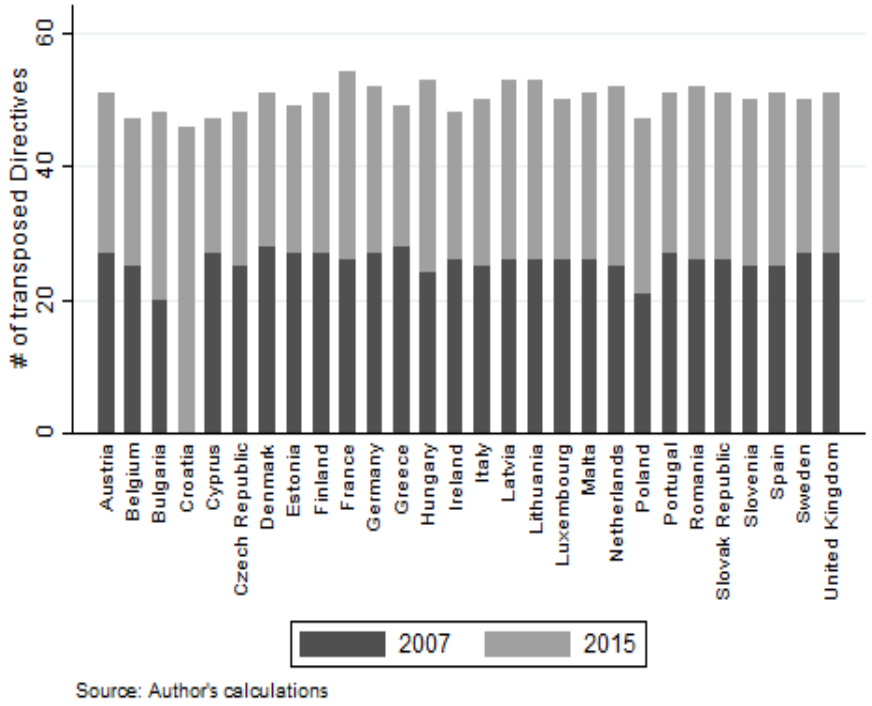


Figure 3.5: Number of the FSAP and post-FSAP Directives transposed into the national law, years 2007 and 2015

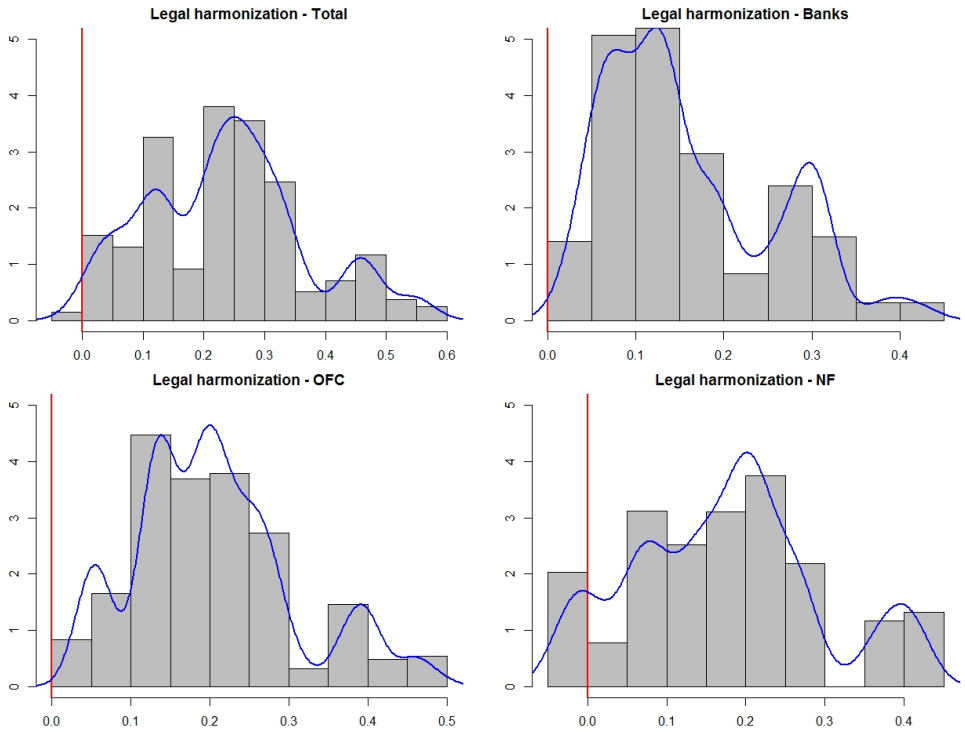


Figure 3.6: Extreme bounds analysis: legal harmonization, debt holdings

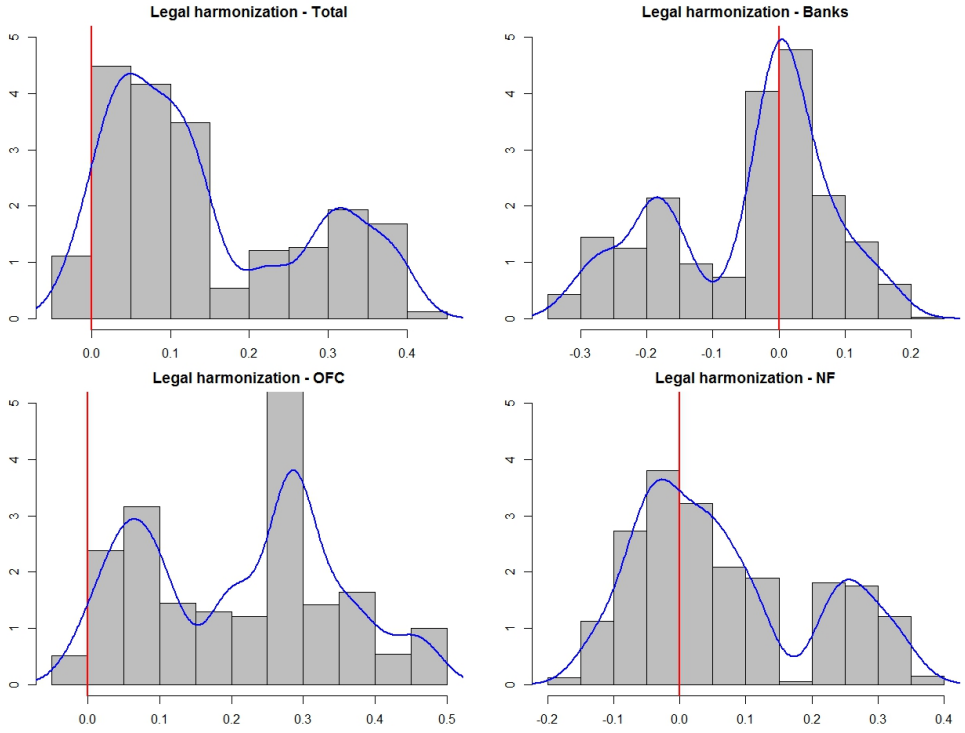


Figure 3.7: Extreme bounds analysis: legal harmonization, equity holdings

3.D Tables

Table 3.3: Hypotheses: Expected effects of legal and institutional harmonization

Variable	Effect on portfolio investment
Legal harmonization	+
Strength of investor protection, difference	-
Insolvency recovery, difference	-
Time to enforce a contract, difference	+
Credit registry coverage, difference	-
Time to pay taxes, difference	+

Note: This Table presents the expected effects of legal harmonization and differences in institutional quality on portfolio investment positions. Differences are computed as the log of the ratio of institutional quality in the holder- and issuer-country.

Table 3.4: The FSAP and post-FSAP Directives

Directive	Title of the Directive	Sector
1998/26/EC	Implementation of the Settlement Finality Directive	Securities
2000/46/EC	Directive on the taking up, pursuit and prudential supervision of the businesses of electronic money institutions	Banking
2000/64/EC	Directive amending the insurance directives and the Investment Services Directive (ISD) to permit information exchange with third countries	Insurance
2001/17/EC	Directive on the reorganization and winding-up of insurance undertakings	Insurance
2001/24/EC	Directive on the reorganization and winding-up of banks	Banking
2001/65/EC	Directive amending the 4th and 7th Company Law Directives to allow fair value accounting	Securities
2001/86/EC	Directive supplementing the Statute for a European Company with regard to the involvement of employees	Securities
2001/97/EC	Directive amending the money laundering directive	Banking
2001/107/EC	1st Directive on UCITS (Undertakings for Collective Investments in Transferable Securities)	Securities
2001/108/EC	2nd Directive on UCITS	Securities
2002/13/EC	Directive amending the solvency margin requirements in the insurance directives	Insurance
2002/47/EC	Directive on financial collateral arrangements	Securities
2002/65/EC	Directive on the Distance of marketing of Financial Services	Insurance
2002/87/EC	Directive on the supplementary supervision of credit institutions, insurance undertakings and investment firms in a financial conglomerate	Banking
2002/83/EC	Solvency I Directive for life insurance	Insurance
2002/92/EC	Directive on insurance mediation	Insurance
2003/6/EC	Directive on insider dealing and market manipulation	Securities
2003/41/EC	Directive on the prudential supervision of pension funds	Insurance
2003/48/EC	Directive on the taxation of savings income in the form of interest payments	Banking

2003/51/EC	Directive modernizing the accounting provisions of the 4th and the 7th Company Law Directives	Securities
2003/71/EC	Directive on prospectuses	Securities
2004/25/EC	Directive on Take Over Bids	Securities
2004/109/EC	Transparency Directive	Securities
2004/39/EC	Directive on Markets in Financial Instruments (update of ISD) - MiFID	Securities
2005/56/EC	10th Company Law Directive on cross-border mergers	Securities
2006/48/EC	Directive on the relating to the taking up and pursuit of the business of credit institutions	Banking
2006/49/EC	Directive on the capital adequacy of investment firms and credit institutions	Banking
2006/43/EC	Directive on statutory audits of annual accounts and consolidated accounts (amendment)	Securities
2006/46/EC	Directive on accounting standards (amendment)	Banking, Insurance, Securities
2007/14/EC	Directive on the harmonization of transparency requirements in relation to information about issuers whose securities are admitted to trading on a regulated market (amendment)	Securities
2007/36/EC	Directive on the exercise of certain rights of shareholders in listed companies	Securities
2007/44/EC	Directive on procedural rules and evaluation criteria for the prudential assessment of acquisitions and increase of holdings in the financial sector (amendment)	Banking, Insurance, Securities
2007/63/EC	Directive on requirement of an independent expert's report on the occasion of merger or division of public limited liability companies (amendment)	Securities
2007/64/EC	Directive on the payment services in the internal market	Banking, Insurance
2009/14/EC	Directive on deposit-guarantee schemes (amendment)	Banking
2009/44/EC	Directive on settlement finality in payment and securities settlement systems and on financial collateral arrangements (amendment)	Securities
2009/49/EC	Directive on certain disclosure requirements for medium-sized companies and the obligation to draw up consolidated accounts (amendment)	Securities
2009/65/EC	Directive on UCITS	Securities
2009/109/EC	Directive on reporting and documentation requirements in the case of mergers and divisions (amendment)	Securities

2009/110/EC	Directive on taking up, pursuit and prudential supervision of the business of electronic money institutions (amendment)	Banking
2009/111/EC	Directive on the capital requirements (amendment)	Banking
2009/138/EC	Directive on the taking-up and pursuit of the business of insurance and reinsurance (Solvency II)	Insurance
2010/73/EC	Directive on the prospectus (amendment)	Securities
2010/76/EC	Directive on the capital requirements (amendment)	Banking
2010/78/EC	Directive on the powers of the European Supervisory Authority (European Banking Authority, European Insurance and Occupational Pensions Authority, and European Securities and Markets Authority) (amendment)	Banking, Insurance, Securities
2011/61/EC	Directive on alternative investment fund managers (amendment)	Securities, Insurance
2011/89/EC	Directive on the supplementary supervision of financial entities in a financial conglomerate (amendment)	Banking
2012/17/EC	Directive on the interconnection of central, commercial and companies registers (amendment)	Securities
2013/14/EC	Directive on the activities and supervision of institutions for occupational retirement provision, on the coordination of laws, regulations and administrative provisions relating to UCITS (amendment)	Insurance, Securities
2013/34/EC	Directive on the annual financial statements, consolidated financial statements and related reports of certain types of undertakings (amendment)	Securities
2013/36/EC	Directive on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms (amendment)	Banking
2013/50/EC	Directive on the harmonization of transparency requirements in relation to information about issuers whose securities are admitted to trading on a regulated market (amendment)	Securities
2014/49/EC	Directive on deposit guarantee schemes	Banking
2014/51/EC	Directive on the powers of the European Supervisory Authority (European Insurance and Occupational Pensions Authority and European Securities and Markets Authority) (amendment)	Insurance, Securities
2014/59/EC	Directive on establishing a framework for the recovery and resolution of credit institutions and investment firms (amendment)	Banking, Securities

Table 3.5: Regression results – Legal harmonization

	Debt				Equity			
	(1) Total	(2) Banks	(3) OFC	(4) NF	(5) Total	(6) Banks	(7) OFC	(8) NF
Common language	0.100	-0.160	0.064	0.061	-0.047	0.367	-0.162	0.035
	(0.194)	(0.178)	(0.247)	(0.179)	(0.176)	(0.288)	(0.209)	(0.216)
Common legal origin	0.696***	0.683***	0.703***	0.802***	0.851***	0.425*	0.843***	0.921***
	(0.123)	(0.136)	(0.161)	(0.140)	(0.145)	(0.243)	(0.166)	(0.166)
log(Distance)	-0.274***	-0.423**	-0.380***	-0.439***	-0.389***	-0.401**	-0.412**	-0.915***
	(0.090)	(0.154)	(0.131)	(0.095)	(0.110)	(0.180)	(0.169)	(0.119)
log(Trade)	0.341***	0.327***	0.237***	0.313***	0.452***	0.535***	0.315**	0.406***
	(0.056)	(0.087)	(0.082)	(0.069)	(0.095)	(0.173)	(0.146)	(0.098)
Both countries in the EU	0.460	-0.183	0.224	0.454	-0.260	-0.899	-0.815*	-0.457
	(0.312)	(0.697)	(0.486)	(0.574)	(0.321)	(0.950)	(0.467)	(0.508)
Both countries in the EA	0.563***	0.528**	0.466**	-0.035	0.146	0.940***	0.087	0.270
	(0.173)	(0.204)	(0.187)	(0.171)	(0.228)	(0.337)	(0.281)	(0.285)
Bilateral harmonization index	0.109	0.119	0.128	0.064	0.101	0.002	0.282**	0.043
	(0.099)	(0.209)	(0.134)	(0.145)	(0.101)	(0.276)	(0.133)	(0.107)
R-squared	0.824	0.743	0.812	0.732	0.836	0.655	0.817	0.777
Observations	11750	7043	7868	6465	11490	4178	7992	6862
Holders countries	33	31	32	32	33	31	32	31

Note: This Table presents estimation results for log bilateral portfolio debt and portfolio equity assets as dependent variables. OFC = other financial corporations (insurances, pension funds, money market funds, others), NF = non-financial private sector (non-financial corporations and private households). The sample covers 2001-2015 period. Holder-year and issuer-year fixed effects are included in all regressions, but are not reported. Standard errors are clustered at the holder-country level.
* p<0.1, ** p<0.05, *** p<0.01

Table 3.6: Regression results – Legal harmonization, all countries

	Debt				Equity			
	(1) Total	(2) Banks	(3) OFC	(4) NF	(5) Total	(6) Banks	(7) OFC	(8) NF
Common language	0.237**	-0.022	0.176	0.264*	0.005	0.548**	-0.136	0.321
	(0.116)	(0.166)	(0.162)	(0.139)	(0.156)	(0.254)	(0.172)	(0.239)
Common legal origin	0.515***	0.579***	0.564***	0.725***	0.837***	0.356	0.769***	0.876***
	(0.145)	(0.182)	(0.202)	(0.150)	(0.155)	(0.271)	(0.154)	(0.162)
log(Distance)	-0.513***	-0.717***	-0.529***	-0.607***	-0.637***	-0.595***	-0.550***	-1.186***
	(0.097)	(0.127)	(0.147)	(0.086)	(0.117)	(0.197)	(0.127)	(0.111)
log(Trade)	0.215***	0.209***	0.121*	0.159***	0.328***	0.317***	0.265***	0.200***
	(0.041)	(0.070)	(0.064)	(0.056)	(0.054)	(0.097)	(0.069)	(0.047)
Both countries in the EU	0.432	-0.258	-0.602	0.458	0.001	0.118	-0.755	0.045
	(0.453)	(0.752)	(0.528)	(0.769)	(0.408)	(0.792)	(0.470)	(0.847)
Both countries in the EA	0.896***	0.692**	0.816**	0.095	0.036	0.637*	0.082	0.199
	(0.275)	(0.279)	(0.341)	(0.196)	(0.268)	(0.359)	(0.297)	(0.318)
Bilateral harmonization index	0.019	0.081	0.251*	0.047	-0.035	-0.099	0.202*	-0.098
	(0.122)	(0.220)	(0.130)	(0.171)	(0.128)	(0.311)	(0.117)	(0.205)
R-squared	0.777	0.707	0.770	0.689	0.785	0.556	0.782	0.719
Observations	22659	11502	14971	10888	21238	6573	14635	11698
Holder countries	33	31	32	32	33	31	32	32

Note: This Table presents estimation results for log bilateral portfolio debt and equity assets as dependent variables. OFC = other financial corporations (insurances, pension funds, money market funds, others), NF = non-financial private sector (non-financial corporations and private households). The sample covers 2001-2015 period. Holder-year and issuer-year fixed effects are included in all regressions, but are not reported. Standard errors are clustered at the holder-country level.

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

Table 3.7: Regression results – Legal harmonization in different markets

	Debt				Equity			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total	Banks	OFC	NF	Total	Banks	OFC	NF
Bilateral harmonization index, total	0.109	0.119	0.128	0.064	0.101	0.002	0.282**	0.043
	(0.099)	(0.209)	(0.134)	(0.145)	(0.101)	(0.276)	(0.133)	(0.107)
Bilateral harmonization index, banking	0.135	0.157	0.167	0.067	0.112	-0.063	0.274*	0.115
	(0.114)	(0.217)	(0.139)	(0.174)	(0.114)	(0.319)	(0.135)	(0.124)
Bilateral harmonization index, securities	0.139	0.157	0.127	0.088	0.092	-0.149	0.273*	-0.013
	(0.110)	(0.227)	(0.147)	(0.171)	(0.115)	(0.278)	(0.145)	(0.127)
Bilateral harmonization index, insurance	0.129	0.167	0.117	-0.017	0.142	-0.100	0.327**	0.088
	(0.122)	(0.239)	(0.166)	(0.189)	(0.115)	(0.308)	(0.153)	(0.137)
Bilateral harmonization index, excluding amendments	0.110	0.108	0.145	0.082	0.126	0.123	0.349**	0.061
	(0.105)	(0.230)	(0.146)	(0.148)	(0.108)	(0.294)	(0.149)	(0.116)

Note: This Table presents estimation results for log bilateral portfolio debt and equity assets as dependent variables. OFC = other financial corporations (insurances, pension funds, money market funds, others), NF = non-financial private sector (non-financial corporations and private households). The sample covers 2001-2015 period. Holder-year and issuer-year fixed effects are included in all regressions, but are not reported. All regressions include the same control variables as in Table 3.5, as well as the same number of observations. Standard errors are clustered at the holder-country level.
* p<0.1, ** p<0.05, *** p<0.01

Table 3.8: Regression results – Institutional differences

	Debt				Equity			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total	Banks	OFC	NF	Total	Banks	OFC	NF
Common language	-0.118	-0.266	-0.261	-0.107	-0.273	0.331	-0.414*	-0.215
	(0.235)	(0.220)	(0.263)	(0.173)	(0.187)	(0.318)	(0.217)	(0.214)
Common legal origin	0.804***	0.739***	0.841***	0.900***	0.845***	0.478**	0.849***	1.122***
	(0.126)	(0.141)	(0.184)	(0.158)	(0.154)	(0.233)	(0.169)	(0.184)
log(Distance)	-0.351***	-0.445***	-0.388***	-0.487***	-0.421***	-0.509**	-0.474***	-0.962***
	(0.093)	(0.140)	(0.127)	(0.114)	(0.111)	(0.190)	(0.158)	(0.136)
log(Trade)	0.344***	0.328***	0.287***	0.363***	0.503***	0.512**	0.331**	0.398***
	(0.057)	(0.090)	(0.066)	(0.074)	(0.096)	(0.192)	(0.146)	(0.099)
Both countries in the EU	0.724***	0.413*	0.674**	0.910***	0.055	-1.001*	0.131	-0.220
	(0.208)	(0.233)	(0.303)	(0.254)	(0.247)	(0.560)	(0.282)	(0.341)
Both countries in the EA	0.765***	0.629***	0.526***	-0.013	0.152	0.883**	0.139	0.313
	(0.188)	(0.215)	(0.181)	(0.208)	(0.198)	(0.389)	(0.243)	(0.254)
log(GDP per capita), holder	1.876	0.479	1.783	0.023	3.342***	3.718**	2.271***	2.816*
	(1.373)	(1.003)	(1.208)	(1.356)	(0.728)	(1.772)	(0.810)	(1.381)
log(GDP per capita), issuer	2.653***	3.533***	5.675***	1.591	0.620	-1.519	1.847***	-0.255
	(0.805)	(1.044)	(0.839)	(1.061)	(0.691)	(1.118)	(0.617)	(0.943)
log(Population), holder	-0.583	2.789	2.853	1.932	4.390**	-3.080	3.589**	0.670
	(2.982)	(2.020)	(2.473)	(2.718)	(2.103)	(2.953)	(1.661)	(1.906)
log(Population), issuer	2.117*	4.003***	2.516***	3.069**	0.275	1.355	0.029	0.849
	(1.053)	(1.253)	(0.831)	(1.330)	(0.864)	(2.208)	(1.143)	(1.227)
Fin. liberalization, holder	1.059	2.033	-1.096	2.307	2.394***	6.609***	1.928***	1.979
	(1.429)	(1.648)	(0.916)	(1.835)	(0.440)	(1.672)	(0.658)	(2.055)
Fin. liberalization, issuer	0.514	0.219	0.731	0.543	-0.908*	1.181	-0.975	-1.003
	(0.333)	(0.477)	(0.443)	(0.432)	(0.532)	(1.543)	(0.612)	(0.923)
Strength of inv. protection, diff.	-0.780	-0.403	-0.635	-1.368**	0.074	1.224	0.163	-0.365
	(0.465)	(0.818)	(0.452)	(0.558)	(0.276)	(0.807)	(0.327)	(0.578)
Insolvency recovery, diff.	-0.223	-0.585***	-0.474***	-0.320	-0.111	-0.601	-0.148	0.066
	(0.227)	(0.178)	(0.171)	(0.199)	(0.148)	(0.377)	(0.160)	(0.181)
Time to enforce a contract, diff.	0.895***	0.532*	0.587***	0.125	0.201	-0.311	0.085	-0.022
	(0.286)	(0.289)	(0.172)	(0.299)	(0.160)	(0.446)	(0.122)	(0.315)
Credit registry coverage, diff.	-0.031	-0.189***	-0.327***	-0.042	0.044	-0.080	-0.022	0.096
	(0.093)	(0.065)	(0.051)	(0.111)	(0.077)	(0.118)	(0.091)	(0.101)
Time to pay taxes, diff.	0.293**	0.106	0.359***	0.424*	-0.277*	-0.161	-0.211	-0.332**
	(0.133)	(0.171)	(0.128)	(0.223)	(0.140)	(0.244)	(0.136)	(0.145)
R-squared	0.806	0.727	0.811	0.702	0.825	0.669	0.804	0.771
Observations	6377	3800	4587	3850	6313	2259	4544	4094
Holder countries	32	30	31	29	32	29	31	29

Note: This Table presents estimation results for log bilateral portfolio debt and equity assets as dependent variables. OFC = other financial corporations (insurances, pension funds, money market funds, others), NF = non-financial private sector (non-financial corporations and private households), diff. = log of the ratio of institutional quality in the holder and in the issuer country. The sample covers 2006-2014 period. Holder-, issuer-, and year-fixed effects are included in all regressions, but are not reported. Standard errors are clustered at the holder-country level.
* p<0.1, ** p<0.05, *** p<0.01

Table 3.9: Regression results – Institutional differences, all countries

	Debt				Equity			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total	Banks	OFC	NF	Total	Banks	OFC	NF
Common language	0.154	-0.177	0.050	0.153	-0.065	0.716**	-0.299	0.131
	(0.156)	(0.190)	(0.186)	(0.146)	(0.196)	(0.272)	(0.182)	(0.257)
Common legal origin	0.517***	0.605***	0.632***	0.733***	0.807***	0.408*	0.741***	0.990***
	(0.152)	(0.187)	(0.197)	(0.160)	(0.142)	(0.236)	(0.164)	(0.181)
log(Distance)	-0.424***	-0.641***	-0.461***	-0.595***	-0.568***	-0.616***	-0.550***	-1.013***
	(0.097)	(0.139)	(0.153)	(0.117)	(0.132)	(0.200)	(0.127)	(0.123)
log(Trade)	0.286***	0.275***	0.197***	0.231***	0.442***	0.396**	0.323***	0.303***
	(0.043)	(0.097)	(0.062)	(0.070)	(0.071)	(0.186)	(0.090)	(0.068)
Both countries in the EU	0.433*	0.353	0.346	0.881***	-0.173	-0.265	-0.015	-0.033
	(0.231)	(0.268)	(0.346)	(0.287)	(0.308)	(0.612)	(0.333)	(0.362)
Both countries in the EA	1.069***	0.771**	0.873***	0.185	0.183	0.682*	0.240	0.315
	(0.258)	(0.285)	(0.259)	(0.227)	(0.223)	(0.369)	(0.254)	(0.296)
log(GDP per capita), holder	1.429	0.794	1.893*	0.658	2.101***	2.915**	0.953	1.989
	(1.080)	(0.827)	(1.047)	(1.072)	(0.695)	(1.404)	(1.186)	(1.275)
log(GDP per capita), issuer	1.401***	1.575*	2.624***	-0.105	0.085	-0.234	1.042*	0.171
	(0.432)	(0.843)	(0.518)	(0.820)	(0.503)	(0.686)	(0.513)	(0.680)
log(Population), holder	-0.297	3.212	2.291	0.928	4.861**	-0.891	3.511*	1.591
	(2.430)	(1.934)	(2.152)	(2.792)	(2.153)	(2.771)	(1.800)	(1.994)
log(Population), issuer	0.318	0.277	1.017	1.897*	1.462	0.481	1.412	-0.565
	(0.593)	(0.864)	(0.626)	(1.013)	(0.986)	(1.325)	(0.973)	(0.850)
Fin. liberalization, holder	0.727	1.823	-1.170*	1.988	2.841***	6.296***	1.912**	2.671
	(0.970)	(1.277)	(0.657)	(1.730)	(0.305)	(1.655)	(0.905)	(1.672)
Fin. liberalization, issuer	0.557***	0.487*	0.712***	0.680**	0.123	1.056	0.124	-0.287
	(0.160)	(0.279)	(0.197)	(0.295)	(0.245)	(0.966)	(0.254)	(0.390)
Strength of inv. protection, diff.	-0.295	0.424	-0.277	-0.564	-0.235	0.337	-0.196	-0.549
	(0.324)	(0.504)	(0.331)	(0.351)	(0.338)	(0.615)	(0.363)	(0.424)
Insolvency recovery, diff.	-0.178	-0.432*	-0.211	-0.003	-0.283***	-0.215	-0.175	0.125
	(0.177)	(0.230)	(0.139)	(0.149)	(0.098)	(0.289)	(0.104)	(0.165)
Time to enforce a contract, diff.	0.803***	0.539*	0.727***	0.099	0.214	0.021	0.272	-0.216
	(0.250)	(0.272)	(0.216)	(0.255)	(0.147)	(0.370)	(0.166)	(0.282)
Credit registry coverage, diff.	-0.027	-0.076	-0.199***	0.068	0.017	0.001	-0.066	0.127
	(0.068)	(0.060)	(0.043)	(0.104)	(0.058)	(0.107)	(0.056)	(0.095)
Time to pay taxes, diff.	0.172	-0.034	0.277**	0.331*	-0.181	0.165	-0.125	-0.167
	(0.105)	(0.162)	(0.106)	(0.187)	(0.142)	(0.264)	(0.127)	(0.129)
R-squared	0.778	0.709	0.768	0.677	0.778	0.590	0.774	0.722
Observations	11209	5647	7992	5914	10544	3229	7606	6212
Holder countries	32	30	31	29	32	29	31	29

Note: This Table presents estimation results for log bilateral portfolio debt and equity assets as dependent variables. OFC = other financial corporations (insurances, pension funds, money market funds, others), NF = non-financial private sector (non-financial corporations and private households), diff. = log of the ratio of institutional quality in the holder and in the issuer country. The sample covers 2006-2014 period. Holder-, issuer-, and year-fixed effects are included in all regressions, but are not reported. Standard errors are clustered at the holder-country level.
* p<0.1, ** p<0.05, *** p<0.01

Table 3.10: Regression results – Issuer-specific characteristics

	Debt				Equity			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total	Banks	OFC	NF	Total	Banks	OFC	NF
Common language	-0.075	-0.259	-0.174	-0.009	-0.232	0.260	-0.336	-0.110
	(0.235)	(0.213)	(0.264)	(0.191)	(0.186)	(0.333)	(0.213)	(0.228)
Common legal origin	0.794***	0.764***	0.793***	0.902***	0.839***	0.470*	0.831***	1.083***
	(0.122)	(0.139)	(0.180)	(0.150)	(0.156)	(0.235)	(0.177)	(0.183)
log(Distance)	-0.336***	-0.456***	-0.386***	-0.498***	-0.394***	-0.473**	-0.425***	-0.944***
	(0.094)	(0.146)	(0.118)	(0.096)	(0.107)	(0.181)	(0.150)	(0.127)
log(Trade)	0.361***	0.334***	0.295***	0.344***	0.513***	0.579***	0.361**	0.409***
	(0.060)	(0.091)	(0.067)	(0.074)	(0.093)	(0.205)	(0.139)	(0.096)
Both countries in the EU	0.740***	0.236	0.504*	0.841***	-0.015	-0.942*	0.096	-0.373
	(0.201)	(0.248)	(0.261)	(0.299)	(0.247)	(0.472)	(0.289)	(0.408)
Both countries in the EA	0.675***	0.626***	0.609***	-0.090	0.145	0.887**	0.116	0.227
	(0.160)	(0.215)	(0.186)	(0.198)	(0.202)	(0.403)	(0.235)	(0.248)
log(GDP per capita), issuer	2.595***	3.179***	5.403***	1.782	0.879	-1.401	2.345***	-0.019
	(0.739)	(1.006)	(0.759)	(1.196)	(0.649)	(1.045)	(0.671)	(0.978)
log(Population), issuer	3.153***	3.517***	3.468***	4.167***	0.907	1.747	0.234	2.636**
	(1.054)	(1.191)	(0.877)	(1.322)	(0.950)	(2.040)	(1.231)	(1.252)
Fin. liberalization, issuer	0.688*	0.545	0.717	0.562	-0.784	1.066	-0.871	-1.002
	(0.353)	(0.556)	(0.442)	(0.407)	(0.522)	(1.266)	(0.603)	(0.887)
Strength of inv. protection, issuer	-0.580	-1.278	-1.198*	0.116	-0.982***	-1.225	-0.865**	-0.286
	(0.386)	(0.809)	(0.635)	(0.777)	(0.356)	(1.369)	(0.367)	(0.548)
Insolvency recovery, issuer	0.109	0.225	0.540***	0.098	-0.018	0.473	0.032	0.108
	(0.162)	(0.212)	(0.182)	(0.267)	(0.182)	(0.511)	(0.207)	(0.311)
Time to enforce a contract, issuer	-0.633**	-0.610**	-0.397	-0.143	0.083	0.145	0.182	0.950***
	(0.252)	(0.270)	(0.234)	(0.315)	(0.190)	(0.498)	(0.172)	(0.296)
Credit registry coverage, issuer	0.234***	0.236***	0.418***	0.251**	0.045	0.069	0.018	0.065
	(0.053)	(0.070)	(0.064)	(0.109)	(0.092)	(0.205)	(0.092)	(0.111)
Time to pay taxes, issuer	-0.499***	-0.128	-0.537***	-0.693***	0.626***	0.360	0.556***	0.650***
	(0.103)	(0.213)	(0.119)	(0.189)	(0.121)	(0.309)	(0.130)	(0.152)
R-squared	0.818	0.735	0.815	0.736	0.829	0.680	0.812	0.773
Observations	6707	4035	4892	4033	6653	2346	4863	4304
Holder countries	33	31	32	30	33	30	32	30

Note: This Table presents estimation results for log bilateral portfolio debt and equity assets as dependent variables. The following equation is estimated:

$$log(A_{i_s jt}) = \alpha_{it} + \theta_j + \eta_t + \gamma Institutions_{it} + \beta X_{ijt} + \epsilon_{i_s jt}$$

OFC = other financial corporations (insurances, pension funds, money market funds, others), NF = non-financial private sector (non-financial corporations and private households). The sample covers 2006-2014 period. Holder-year, issuer-, and year-fixed effects are included in all regressions, but are not reported. Standard errors are clustered at the holder-country level.
* p<0.1, ** p<0.05, *** p<0.01

Table 3.11: Regression results – Holder-specific characteristics

	Debt				Equity			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total	Banks	OFC	NF	Total	Banks	OFC	NF
Common language	0.030	-0.230	-0.045	0.042	-0.172	0.433	-0.275	-0.144
	(0.220)	(0.216)	(0.273)	(0.164)	(0.186)	(0.334)	(0.206)	(0.230)
Common legal origin	0.736***	0.703***	0.745***	0.793***	0.865***	0.510*	0.861***	1.066***
	(0.135)	(0.143)	(0.175)	(0.161)	(0.144)	(0.254)	(0.163)	(0.176)
log(Distance)	-0.307***	-0.409***	-0.362**	-0.439***	-0.405***	-0.502***	-0.441**	-0.982***
	(0.094)	(0.137)	(0.148)	(0.114)	(0.129)	(0.177)	(0.181)	(0.136)
log(Trade)	0.344***	0.333***	0.279***	0.351***	0.484***	0.406**	0.344**	0.368***
	(0.053)	(0.083)	(0.071)	(0.074)	(0.101)	(0.164)	(0.153)	(0.094)
Both countries in the EU	0.753***	0.363	0.816**	0.791***	0.151	-0.936*	0.216	-0.190
	(0.250)	(0.227)	(0.302)	(0.240)	(0.274)	(0.537)	(0.305)	(0.342)
Both countries in the EA	0.618***	0.553**	0.362*	-0.105	0.097	0.831**	0.097	0.281
	(0.195)	(0.216)	(0.191)	(0.214)	(0.222)	(0.357)	(0.276)	(0.283)
log(GDP per capita), holder	1.767	0.105	1.428	0.104	2.988***	3.681*	2.225**	2.269
	(1.270)	(0.892)	(1.248)	(1.569)	(0.631)	(1.868)	(0.936)	(1.434)
log(Population), holder	-0.246	3.017	1.753	1.932	4.547**	-5.610*	2.797	2.172
	(2.411)	(2.245)	(2.663)	(2.933)	(1.820)	(2.835)	(1.792)	(2.016)
Fin. liberalization, holder	0.968	1.495	-0.836	2.076	2.596***	5.706**	2.225***	1.503
	(1.353)	(1.732)	(1.004)	(1.624)	(0.316)	(2.070)	(0.759)	(1.850)
Strength of inv. protection, holder	-1.908***	-2.217***	-1.682***	-2.045*	-1.076***	0.210	-0.615	-0.638
	(0.649)	(0.729)	(0.476)	(1.004)	(0.347)	(0.992)	(0.436)	(0.727)
Insolvency recovery, holder	-0.229	-0.913***	-0.417**	-0.515	-0.240	-0.776	-0.221	0.212
	(0.378)	(0.292)	(0.179)	(0.375)	(0.220)	(0.529)	(0.144)	(0.221)
Time to enforce a contract, holder	0.875*	0.141	0.579**	-0.247	0.458*	-0.668	0.318	0.688
	(0.457)	(0.351)	(0.240)	(0.389)	(0.239)	(0.944)	(0.193)	(0.475)
Credit registry coverage, holder	0.160	-0.009	-0.065	0.343*	0.104	-0.171	-0.042	0.315
	(0.123)	(0.153)	(0.093)	(0.182)	(0.096)	(0.187)	(0.191)	(0.213)
Time to pay taxes, holder	-0.020	0.028	0.096	0.095	0.089	-0.227	0.114	-0.134
	(0.273)	(0.259)	(0.209)	(0.550)	(0.157)	(0.469)	(0.172)	(0.242)
R-squared	0.806	0.732	0.812	0.700	0.827	0.647	0.810	0.778
Observations	7011	4197	5029	4250	6891	2565	4976	4498
Holder countries	32	30	31	29	32	30	31	30

Note: This Table presents estimation results for log bilateral portfolio debt and equity assets as dependent variables. The following equation is estimated:

$$log(A_{i_s jt}) = \alpha_i + \theta_{jt} + \eta_t + \gamma Institutions_{jt} + \beta X_{ijt} + \epsilon_{i_s jt}$$

OFC = other financial corporations (insurances, pension funds, money market funds, others), NF = non-financial private sector (non-financial corporations and private households). The sample covers 2006-2014 period. Issuer-year, holder-, and year-fixed effects are included in all regressions, but are not reported. Standard errors are clustered at the holder-country level.
* p<0.1, ** p<0.05, *** p<0.01

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Eidesstattliche Erklärung

Erklärung gem. § 4 Abs. 2

Hiermit erkläre ich, dass ich mich noch keinem Promotionsverfahren unterzogen oder um Zulassung zu einem solchen beworben habe, und die Dissertation in der gleichen oder einer anderen Fassung bzw. Überarbeitung einer anderen Fakultät, einem Prüfungsausschuss oder einem Fachvertreter an einer anderen Hochschule nicht bereits zur Überprüfung vorgelegen hat.

Tatsiana Kliatskova
Berlin, den 16.05.2019

Liste verwendeter Hilfsmittel

Erklärung gem. § 10 Abs. 3

Hiermit erkläre ich, dass ich für die Dissertation folgende Hilfsmittel und Hilfen verwendet habe:

- RStudio 1.1.463 basierend auf R 3.3.2
- Stata 14.2
- Microsoft Excel 2016
- LaTeX
- Siehe auch Literatur- und Quellenangaben

Auf dieser Grundlage habe ich die Arbeit selbstständig verfasst.

Tatsiana Kliatskova
Berlin, den 16.05.2019