

Cross-Border Banking and Macroeconomic Determinants

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Abstract

This paper studies the bilateral determinants of the international asset positions of banks, and subsequent bilateral adjustment during the global financial crisis and ensuing recovery phase. We find empirical support for traditional gravity-type variables. Exploiting a comprehensive dataset of bilateral bank assets, combined with a cross-country database on capital controls and macroeconomic policies, empirical evidence is provided for the effects of macroeconomic tools on the portfolio reallocation of internationally active banks. Specifically, higher current account balances in recipient countries are associated with higher inflows in debt assets, while restrictions on asset inflows and higher central bank reserves are related to lower cross-border flows of bank investment during the crisis and post-crisis periods, with heterogeneous effects across asset type. Finally, stronger institutions in recipient countries are positively associated with the international investment of banks, with inflows to debt assets being the most sensitive asset category across the financial cycle.

Keywords: Cross-Border Banking, Loans, International Portfolio Securities, Capital Controls, Institutional Quality.

JEL Codes: F30, F41, G15, G21

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1. Introduction

In recent years, the magnitude and composition of international investment has undergone dramatic change. Globally, the composition of investment has shifted towards foreign direct investment (FDI), away from the other investment category (largely reflecting bank activities), with mixed re-allocation within the components of the portfolio investment category (Bussière et al., 2016). Bank deleveraging has been particularly pronounced in the wake of the global financial crisis resulting from interbank market stress, the European sovereign debt crisis and increased regulatory requirements, among other factors.

The purpose of this paper is twofold. Firstly, it is to investigate the bilateral determinants of the bilateral adjustment in the international assets of banks during the global financial crisis and the subsequent recovery phase. Second, it is to examine the role of capital controls and macroeconomic policies as determinants of bilateral adjustment in the international assets of banks. For both researchers and policymakers, greater understanding of the drivers of adjustment patterns is important in order to gain insight to the behaviour of internationally active banks across the financial cycle.

At the theoretical level, the literature has emphasized the importance of financial frictions in determining international investment patterns (Martin and Rey, 2004; Okawa and Van Wincoop, 2012). At the empirical level, the effects of these frictions on international assets have been extensively studied by Aviat and Coeurdacier (2007), Daude and Fratzscher (2008), Lane and Milesi-Ferretti (2008), Martin and Rey (2004), Portes and Rey (2005), Stein and Daude (2007) among others. Commonly, geographic distance is recognised as a proxy for informational frictions, whereby greater geographical distance between countries is associated with increased costs of conducting international financial transactions, negatively affecting both bilateral financial flows and holdings. Other variables employed to account for the bilateral linkages in international portfolios include bilateral economic variables, common cultural and institutional ties (Lane, 2006; Lane and Milesi-Ferretti, 2008).¹

¹In terms of bilateral positions of banks, Buch (2005) applied the gravity model to bilateral data on the

Taking a different perspective, Galstyan and Lane (2013) examine bilateral portfolio adjustment across time. They find that bilateral portfolio adjustment during the height of the global financial crisis is driven by a mean reversion effect, with investors disproportionately reallocating portfolios away from investments in which they were over-weight pre-crisis. A similar effect is evident for the recovery phase of the crisis. Duade and Fratzscher (2008), in their exploration of the pecking-order hypothesis, focus on bilateral capital holdings, as opposed to flows, in a cross-sectional analysis. Their empirical analysis highlights that the primary determinants of the pecking order of cross-border investment are informational frictions and host-country institutional quality.

Building on this literature, first we empirically assess the bilateral determinants of international asset positions of banks. Next, we assess whether greater bilateral adjustment of the international assets of banks reflects greater deleveraging at both the height of the global financial crisis and during the subsequent recovery period. Our evidence suggests that gravity-type variables matter. Distance negatively affects the cross-border investment of banks. Larger distances are correlated with greater adjustment in bilateral holdings of the bond and loan assets of banks but not equity portfolio investment. Consistent with the related literature, distance retains its importance as a proxy for informational frictions in the internal trade of financial assets. This effect is relatively more pronounced during the post-financial crisis period. We also find a clear evidence of a hedging motive by which investors guard against the risks of depreciation vis-à-vis major import partners.

The second contribution of this paper is to look at the role of macroeconomic determinants such as the current account, capital controls, international reserves, quality of institution and effectiveness of governance as determinants of bilateral adjustment in the international assets of banks. Pre-crisis external imbalances tend to have predictive power for post-crisis macroeconomic outcomes (Lane and Milesi-Ferretti, 2014). Controls

international assets and liabilities of banking systems from five advanced economies vis-à-vis 50 countries, between 1983 and 1999, concluding that distance as a driver of the cross-border assets of banks continues to matter during the period under review despite increased technological progress. In a gravity model of international banking, Buch et al. (2013) find no diminishing effect for informational frictions for international banks during the global financial crisis.

on capital inflows aim to reduce the likelihood of surges and volatility in foreign borrowing which can contribute to credit booms thereby posing risks to domestic financial stability. Since the global financial crisis international reserve holdings have increased substantially to mitigate against rapid shifts in international investors' portfolios and sudden stops (Gosh et al., 2012). Finally, sound domestic policies, reflected in the ability of governments to devise and implement effective policies, are also potentially important determinants of foreign investment (Calvo, 2007; Daude and Fratzcher, 2008).

To this end, we explore the role of the current account, macroeconomic policies and capital flow management measures as determinants of the international portfolio decisions of banks. In relation to external imbalances we find that during the crisis and post crisis periods a higher current account balance is positively associated with higher investment in debt assets, a finding consistent with greater outflows from countries with larger current account deficits.

During the acute phase of the global financial crisis the bilateral adjustment in the international assets of banks are negatively related to capital flow management measures - including capital controls and central bank reserves - and the effects are heterogeneous across asset type. A higher level of central bank reserves in destination countries is negatively associated with the adjustment of foreign banks' investment in debt and equity, with the former across the financial cycle and the latter during the recovery period. During the recovery period, we find that the bonds of banks in holding countries are sensitive to restrictions on capital in destination countries, suggesting capital controls do not indicate a more stable environment for the destination country. Finally, a high quality of governance on the eve of the financial crisis is important for holdings of portfolio and loan assets.

The remainder of the paper is structured as follows. Section 2 presents the empirical approach. The data sources drawn upon are described in Section 3. The empirical results are presented and discussed in Section 4. Finally, Section 5 concludes.

2. Empirical Framework

2.1. A Glance at the Data

The period preceding the global financial crisis witnessed increased global activities of internationally active banks. This manifested in the significant growth of cross-border bank flows, reflected in an expansion of their asset portfolios. On the eve of the global financial crisis the asset composition of international banks was dominated by loans, followed by debt, with equity assets only accounting for 3.7 per cent of holdings (Figure 1). Ex-post the global financial crisis, there has been a retrenchment in the most liquid component of banks' international portfolios, namely loan assets, with portfolio re-allocation predominately towards debt assets (Figure 1).

The compositional shift towards debt assets is also reflected in the growth rates of banks' cross-border assets, with adjustment towards debt assets increasing during the acute phase of the global financial crisis, and falling back slightly between 2009 and 2014 (Figure 2). Growth in equity assets contracted during the financial crisis, most likely driven by falling equity prices during this period of global stress in financial markets. During the recovery phase there has been positive growth in international banks' investment in equity. The retrenchment in the loan component of the international portfolios of banks was greatest between 2007 and 2009, with continued but modest contraction during the recovery phase (Figure 2).

The dynamics in the international asset portfolios of banks following the global financial crisis point towards portfolio reallocation away from relatively liquid assets and towards equity. The latter is perceived by global investors as a comparatively more sticky asset category during periods of heightened economic and financial risk. Overall, the figures point to asymmetric adjustment in the international assets of banks during the global financial crisis and the subsequent recovery phase. While these portfolio re-allocations are driven by bilateral, global, holding and receiving country factors, our primary interest lies in understanding the bilateral determinants and the macroeconomic conditions of flow-receiving countries. To this end, in the next sub-section we describe

the adopted empirical specification as well as bilateral and country-specific determinants of banks' international assets.

2.2. Empirical Specification

The first objective of the paper is to study the geographical distribution of international assets of banks in 2007 as well as the corresponding bilateral adjustment patterns of these assets during the crisis period (2007-2009) and the post-crisis period (2009-2014). Accordingly, we examine the cross-border distribution of international asset positions by estimating the following specification

$$\ln(A_{ij,07}) = \alpha_i + \alpha_j + \mathbf{g}_{ij,07}\boldsymbol{\theta} + \epsilon_{ij} \quad (1)$$

where $\ln(A_{ij,07})$ is the log of the outstanding bilateral position by reporting country i in destination country j at the end of 2007, α_i and α_j are source-country and destination-country dummy variables, $\mathbf{g}_{ij,07}$ is a row vector of gravity-type controls with $\boldsymbol{\theta}$ column vector of coefficients. The country-dummies are included to capture variables affecting aggregate foreign portfolio holdings by source country i , and variables affecting the aggregate foreign portfolio liability position of destination country j .²

The control variables we consider are the logarithm of bilateral imports, the logarithm of bilateral distance between country capitals and a dummy variable taking a value of 1 for shared language. Following the established literature, we interpret bilateral distance as capturing bilateral information costs as well as trade costs such as communication obstacles in real time.³ While the level of bilateral trade can improve bilateral information, the use of bilateral imports reflect an additional mechanism (hedging motive) by which investors guard against the risks of depreciation vis-à-vis major import partners.⁴ Finally, we include dummies that take the value 1 if both source and destination coun-

²As highlighted by Galstyan and Lane (2013), these source/destination country fixed effects filter common trends and valuation effects out of portfolio allocation, so that what remains is the purely bilateral variation.

³See Aviat and Coeurdacier (2007), Daude and Fratzscher (2008), Lane and Milesi-Ferretti (2008), Martin and Rey (2004), Portes and Rey (2005), Stein and Daude (2007).

⁴See Obstfeld and Rogoff (2001), Aviat and Coeurdacier (2007).

tries are members of a regional bloc (euro area and/or European Economic Association), and 0 otherwise. In this regard, the euro area dummy captures the effect of a common currency on portfolio allocations for different asset classes. More generally, one can expect increased bilateral positions as long as the common membership of international institutions reduces informational frictions. Accordingly, the inclusion of membership dummies is warranted on grounds of informational frictions as well as political economy considerations.

Next, we examine the shifts in cross-border assets of banks during the crisis period (2007-2009) with the following specification

$$\Delta \ln(A_{ij,07-09}) = \beta_i + \beta_j + \gamma \ln(A_{ij,07}) + \mathbf{g}_{ij,07}\boldsymbol{\eta} + \varepsilon_{ij} \quad (2)$$

where the dependent variable is the logarithmic change of the outstanding bilateral position by source country i in destination country j between end-2007 and end-2009, $\mathbf{g}_{ij,07}$ is the same row vector of gravity-type controls as in Equation (1). In the current specification β_i absorbs uniform shifts in foreign asset portfolios of a country's banks (ie. pull back from all foreign markets), while β_j absorbs uniform portfolio shifts by all foreign banks (ie. pull back from country j).⁵ Note that the coefficient γ on $\ln(A_{ij,07})$ captures the partial effect of the mis-allocation of bank holdings at the end of 2007 on the subsequent adjustment during the crisis period.⁶

Finally, we analyse the shifts in international asset holdings of banks during the post crisis period (2009-2014) by running

$$\Delta \ln(A_{ij,09-14}) = \mu_i + \mu_j + \varpi \Delta \ln(A_{ij,07-09}) + \chi \ln(A_{ij,07}) + \mathbf{g}_{ij,07}\boldsymbol{\lambda} + u_{ij} \quad (3)$$

where the dependent variable is the logarithmic change of the outstanding bilateral position by source country i in destination country j between end-2009 and end-2014,

⁵Observe that β_j also controls for asset price movements, since shifts in the dollar prices of assets in country j are common to all investors (Galstyan and Lane, 2013).

⁶By the application of the Frisch-Waugh-Lovell theorem, the partial coefficient can be estimated by regressing the residual vector $\hat{\varepsilon}_{ij}$ from $\Delta \ln(A_{ij,07-09}) = \beta_i + \beta_j + \mathbf{g}_{ij,07}\boldsymbol{\eta} + \varepsilon_{ij}$ specification on the residual vector $\hat{\varepsilon}_{ij}$ from Equation (1) (Davidson and MacKinnon, 2004).

μ_i and μ_j are source-country and destination-country dummies, and $\mathbf{g}_{ij,07}$ is the same row vector of gravity-type controls as in Equation (2). Note that the coefficient ϖ on $\Delta \ln(A_{ij,07-09})$ captures the partial effect of mis-adjustment of bank holdings during the crisis period on the subsequent adjustment during the post-crisis period.

Equations (1), (2) and (3) are estimated for long-term debt, equity and loans asset classes by the method of seemingly unrelated regressions (SUR) of Zellner (1962) for an unbalanced-panel.⁷

The second objective of the paper is to explore the aggregate determinants of shifts in international assets of banks. To this end, we extract the destination-country fixed characteristics from equations (1)-(3) and relate these to various controls as follows

$$\hat{\rho} = \text{corr}(\vartheta_j, p_j) \quad (4)$$

where $\hat{\rho}$ represents the pairwise Pearson correlation coefficient between the extracted country-fixed effects from various specifications $\vartheta_j \in (\alpha_j, \beta_j, \mu_j)$ and the control variables p_j at the beginning of the period under consideration (crises and post-crisis).

The list of control variables includes: (i) the current account balance as share of GDP since it has been shown that pre-crisis external imbalances tend to have predictive power for post-crisis macroeconomic outcomes (Lane and Milesi-Ferretti, 2014); (ii) the overall capital-flow restriction index, since controls on capital inflows aim to reduce the likelihood of surges and volatility in foreign borrowing which can contribute to credit booms thereby posing risks to domestic financial stability; (iii) reserve assets under the control of monetary authorities as a share of GDP, since international reserve holdings tend to mitigate against rapid shifts in international investors' portfolios and sudden stops (Gosh et al., 2012); (iv) regulatory quality index and index of government effectiveness, since sound domestic policies, reflected in the ability of governments to devise and implement effective policies, are also potentially important determinants of foreign invest-

⁷While the original SUR method assumes a balanced panel, we have opted to use an unbalanced panel in order to maximize information by employing more observations. It is important to mention that in the case of unbalanced panel the SUR method cannot be proven to deliver a positive definite residual covariance matrix. We thank Christopher Baum for pointing this out and sharing his STATA code.

ment (Calvo, 2007; Daude and Fratzcher, 2008).

3. Data

The data employed in our analysis are combined from four different datasets. We discuss these individually.

3.1. Coordinated Portfolio Investment Survey

Since 2001 the CPIS, published by the IMF, has reported bilateral country holdings of portfolio investment assets on an annual basis and now covers the end-year positions of 82 reporting countries.⁸ Portfolio assets comprise holdings of equity and tradable securities, including debt securities such as bonds, notes and money market instruments. Equity assets differ from equity holdings greater than ten per cent of the voting shares/power of an enterprise and do not entitle an investor to legal control over the firm, which are defined as FDI assets. The data are conceptually consistent with the balance of payments/international investment position statistics in that they are collated in accordance with the residency principle (IMF CPIS Guide Second Edition 2002, IMF BPM6 2011).

To assess the adjustment in bilateral portfolio asset holdings of banks we exploit recent enhancements to the CPIS. Since 2013 the IMF has included sectoral detail of bilateral country holdings in its CPIS dataset. Sectors covered in the newly enhanced dataset include: central banks; deposit-taking corporations except the central banks (i.e. banks); other financial corporations (split into insurance companies and pension funds, money market funds and other); general government; non-financial corporations; households; and Non-Profit Institutions Serving Households (NPISHs). For the banking sector bilateral portfolio asset holdings are available for 54 countries.⁹

⁸The IMF commenced regular production of the CPIS in 2001, however, a once off limited version of the CPIS is also available for year 1997.

⁹For a detailed discussion of the newly available sectoral breakdowns of reporting countries bilateral asset holdings see Galstyan et al. (2016).

3.2. Locational Banking Statistics

The financial claims of banks in the form of loans are not available from the CPIS dataset. To fill this gap we augment the sectoral CPIS data for banks with bilateral country loan data from the locational banking statistics of the BIS. These data contain information on the bilateral holdings of loans issued to non-residents by the banking system resident in the reporting country. We consider all bilateral holdings of loans irrespective of the sector of the non-resident debtor. The bilateral dataset contains information for 45 banking systems reporting to the BIS at a quarterly frequency.

Consistent with the CPIS data, these data are based on the residency principal. Quarterly data on bilateral bank holdings of loans are employed for 45 countries, 21 of which are advanced and 24 are emerging. Similar to the CPIS data, the cross-border loans of banks are compiled on a first counterpart basis.

3.3. Global Financial Safety Net

We exploit the new database on the global financial safety net (GFSN) of Scheubel and Stracca (2016) to identify factors which have the potential to influence international trade in assets. This dataset contains safety measures aimed at preventing and stabilising financial crises, including central bank foreign currency reserves, swap lines, support from the International Monetary Fund and regional financing arrangements. 198 countries are included in the database for the years 1960 to 2014.

To control for aggregate external imbalances of a country the current account balance is sourced from the GFSN database. Central bank reserves as a percentage of GDP are also drawn from the GFSN motivated by their use as a macroeconomic policy instrument relevant for cross-border banking activities. To analyse the effect of capital controls on the investment adjustment of banks, we consider the capital flow restriction index for all asset categories of Fernández et al. (2015), sourced from the database. We also investigate the role of institutional quality as a determinant of the composition of cross-border bank assets. Governance indicators aimed at capturing the capacity of governments in destination countries to successfully implement effective and credible policies are reg-

ulatory quality and government effectiveness indices. Both indices are drawn from the GFSN.

3.4. Gravity and Institutional Membership

Geographical distance between country i and country j , a proxy for information costs, and a common language variable are sourced from the CEPII Distances database. Bilateral import data is obtained from the IMF's Direction of Trade Statistics. Membership of a regional bloc is taken from www.ecb.int for the euro area www.europa.eu for the European Economic Association.

Merging these four datasets results in our final data sample broadly containing 50 reporters over the period 2007 to 2014, 17 of which are advanced and 33 are emerging.¹⁰ Offshore financial centres are dropped from the dataset motivated by their significant role in intermediating cross-border investment (Lane and Milesi-Ferretti, 2011). We acknowledge the final dataset contains many zeros, given country i reports no asset holdings of country j in the CPIS dataset and comparatively lower coverage of countries in the locational banking statistics of the BIS. These are, however, trivial holdings or pertain to minor destinations. Accordingly, to avoid skewed results, we drop this subset of data.

4. Results

4.1. Holdings and Adjustments

Table 1 presents results for international assets of banks at the beginning of the crisis period. Bilateral imports are consistently significant as a covariate across all specifications. The positive sign suggests that banks hedge against the risk of currency depreciation by holding portfolio assets of their major import partners (Obstfeld and Rogoff, 2001). This effect is strongest for equity securities, followed by international loans and bonds. The distance effect is negative and statistically significant across all specifications, with no variation in the distance coefficient across the asset classes. As with the previous two

¹⁰The number of countries varies by asset class. See the Appendix for a detailed list of countries.

controls, a common language is essential for cross-border asset holdings of banks, with countries sharing a common language having larger cross-border positions. Finally, the institutional variables appear to be less important for banks. In particular, only cross-border holdings of long-term debt assets show a significantly positive covariation with common membership of the euro area, while the EEA membership dummy, with a negative coefficient, is marginally important for bank loans only.

Turning to the crisis period, Table 2 presents the results for the regression equation (2). Across all specifications, the shift in bilateral bank assets is significantly negatively correlated with the level of the initial position. The coefficient on the latter variable captures the partial effect of end-2007 mis-allocations on the subsequent adjustment during the crisis period. Accordingly, there is a very significant tendency of retraction in the case of over-exposure. This effect is strongest for international portfolio equity assets. In relation to the gravity variables, it is interesting to observe a positive and significant coefficient for bilateral imports in the case of equity securities. For both bonds and loans distance is significantly negative, while the language dummy is significantly positive only for bonds. Finally, common membership of the euro area is significantly positive for bank loans only.

Table 3 presents the results for the post-crisis period. The negative and statistically significant coefficient on crisis-period bank flows underlines a tendency of post-crisis position-building (assuming more under-investment during the crisis). In relation to the remaining variables, the table paints a somewhat similar picture to the crisis period. In particular, the shifts in bilateral bank holdings are significantly negatively correlated with the level of the initial positions in 2007. Trade is significant for equities and loans but is insignificant for bonds. The table confirms that capital withdrawal is smaller from neighbouring countries: the coefficient on distance is significantly negative for bonds and loans, and is insignificant for portfolio equity assets. Neither language nor membership of regional blocks is significantly associated with bank flows during the 2009-2014 period.

4.2. Destination Countries and Macroeconomic Characteristics

In the previous sub-section, destination-country characteristics were applied to account for factors common across the banks of all source countries. Examples include: (i) a well-performing destination is likely to experience smaller withdrawal of loans by all source countries, and (ii) the introduction of capital restrictions via increased reserve requirements of country j is a common factor faced by the rest of the world, and ought to have the greatest influence on the loan component of assets held by banks in source countries.

To gain some insight into the characteristics of host countries relevant for the international portfolio decisions of banks, we extract destination fixed-effects from equations (1) - (3) and correlate these across the asset classes.¹¹ Table 4 points towards positive correlations between the fixed country characteristics for end-2007: the correlation coefficient between FE-loans and FE-debt stands at 0.73, while the correlation coefficient between FE-equity and FE-debt stands at 0.39.¹² For the subsequent periods, only FE-equity and FE-debt are correlated with a coefficient of 0.38 in the post-crisis period.

Table 5 presents correlations for FE-assets across periods. It is informative to observe significant cross-period correlations for bank loans and bank holdings of debt assets. There is no positive cross-period correlation for bank holdings of portfolio equities. These findings suggest that, while correlated, destination country characteristics that influence investors' portfolio allocation decisions vary substantially by asset-classes. Furthermore, the factors that affect portfolio allocation across assets also affect the dynamics of adjustments.

To further explain the destination-country fixed effects, we relate them on bivariate basis to the current account, capital controls, international reserves, quality of institution and effectiveness of governance.^{13,14} Figures 3, 4 and 5 show the scatterplots between the extracted fixed effects and macro determinants, while Tables 6, 7 and 8 show the

¹¹Only statistically significant fixed effects are used.

¹²For simplicity, we will refer to the extracted fixed-country characteristics as FE-asset.

¹³Due to the unbalanced nature of the extracted fixed effects we choose to use bivariate correlations instead of multivariate correlations with a smaller set of overlapping observations.

¹⁴These variables capture the state of policy at the beginning of period under consideration.

corresponding correlation coefficients.

Figure 3 and Table 6 report the results for the first set of correlations, where the extracted destination-country fixed effects from equation (1) are related to each asset class separately at the beginning of the crisis period, 2007. Overall, the results indicate that the selected macroeconomic determinants account for substantial variation of banks' asset holdings at end-2007. For instance, higher current account balances are associated with larger holdings of investment in equity and loan assets, while greater international reserves are associated with lower holdings of debt and loan assets at the beginning of the global financial crisis. Similar to reserves, restrictions on capital flows are inversely related to holdings of debt asset. Finally, institutional quality is important for all three asset categories: cross-border holdings of assets by foreign banks show a positive correlation with both indicators of governance quality in destination countries.

A striking feature of 2007-2009 period is the statistical insignificance of host-country fixed effects in equity regressions, highlighting the global nature of pull out from this asset class. Turning to the macroeconomic variables in Figure 4 and Table 7, a higher current account balance is positively associated with higher investment in debt assets, a finding consistent with greater outflows from countries with larger current account deficits. Capital controls in place at the end of 2007 are negatively related to international portfolio debt flows. The lack of significant correlations of ex-ante indicators of capital controls with loans suggest this is a relatively stable source of finance from foreign banks for investment recipients in destination countries during crisis periods. This finding provides support for Magud et al. (2011), that capital controls are important for the composition of capital flows. It is also consistent with Kose et al. (1999) who show that the composition of capital matters for sudden stops and flow reversals. Turning to reserves, the greater international reserves in place at the end of 2007 are negatively associated with cross-border flows of bank debt. This indicates that ex-ante central bank insurance against sudden stops in capital is not successful in mitigating outflows from a liquid component of foreign assets, which have a tendency to display relatively greater volatility and pro-cyclicality. Thus we find support for the idea that foreign investors

have a preference for more liquid assets that can be reversed during periods of increased global risk such as that experienced during the global financial crisis. Finally, a higher quality of governance in destination countries shows a positive correlation with the holdings of debt and loan assets by foreign banks.

Figure 5 and Table 8 report the results of destination-country fixed effects regressions, extracted from equation (3), for the post-crisis period, 2009 to 2014. There continues to exist a positive correlation between current account balances and flows of debt assets, while greater central bank reserves at the end of 2009 are negatively correlated with international flows of banks debt and equity assets. Higher restrictions in place on capital flows at the end of 2009 are correlated with a lower flow of international portfolio debt assets but not with flows of equity or loans. In this context, tighter capital controls signal to banks in source countries that governments implementing greater restrictions are less tolerant of foreign investment inflows (Forbes et al., 2016). A higher level of reserves in place ex-post the global financial crisis does not protect destination countries from declines in portfolio investment from source countries' banks. Finally, a higher quality of regulation and governance is positively related to lending denominated in debt securities by foreign banks.

To summarise, these results confirm that capital controls, macroeconomic and institutional factors in destination countries are important determinants of the composition of the international portfolios of banks, displaying heterogeneity in the reaction of capital type to different types of macroeconomic factors across the financial cycle. Relatively more liquid assets (debt securities) are most sensitive to changes in capital controls and institutional factors in the destination country throughout the financial cycle. In contrast, the most liquid component of cross-border assets (loans) is not significantly associated with capital controls or institutional quality during the global financial crisis or during the recovery period.

During the recovery period, debt is the form of capital investment in destination countries by banks that is predominantly moulded by capital controls and country-specific factors. Overall these findings contribute to the related literature, that while macroeco-

nomic policies are determinants of shifts in the portfolio allocation of investors in destination countries (Montiel and Reinhart, 1999), the effectiveness of capital flow management is mixed across both time and asset type (Forbes et al., 2015).

5. Conclusions

In this paper we exploit the sectoral detail of banks in the enhanced CPIS dataset augmented with the bilateral loans of banks from the locational banking statistics of the BIS. The two datasets combined provide a comprehensive insight into cross-border asset holdings of banks.¹⁵ In our empirical analysis, we assess the bilateral determinants of international asset positions of banks as well as the bilateral adjustment during the crisis and post-crisis periods. Our evidence suggests that traditional gravity-type variables matter.

Our research also contributes to the growing strand of literature that examines the interconnectedness between macroeconomic policy and dynamics in cross-border banking. We provide empirical evidence on how these macroeconomic tools affect the portfolio decisions of internationally active banks. We find that the current account, capital controls, international reserves, quality of institutions, effectiveness of governance are important country characteristics that influence the asset portfolios of internationally active banks across the financial cycle, with heterogeneous effects across asset type. Accordingly, the findings in this paper are relevant for both the related literature and inform the policy debate concerning the ability of capital controls and macroeconomic policies to effectively influence the portfolios of international investors.

¹⁵Sectoral detail in the Coordinated Direct Investment Survey of the IMF would provide for complete bilateral positions of banks.

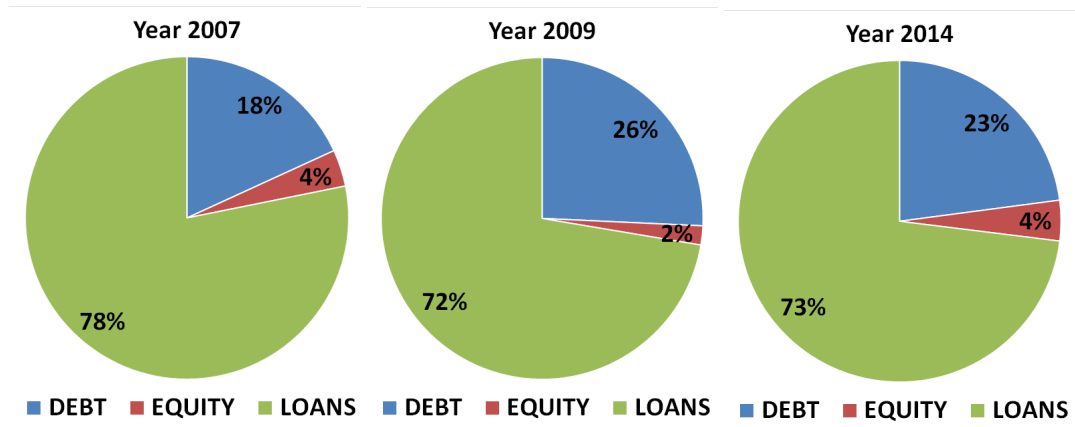
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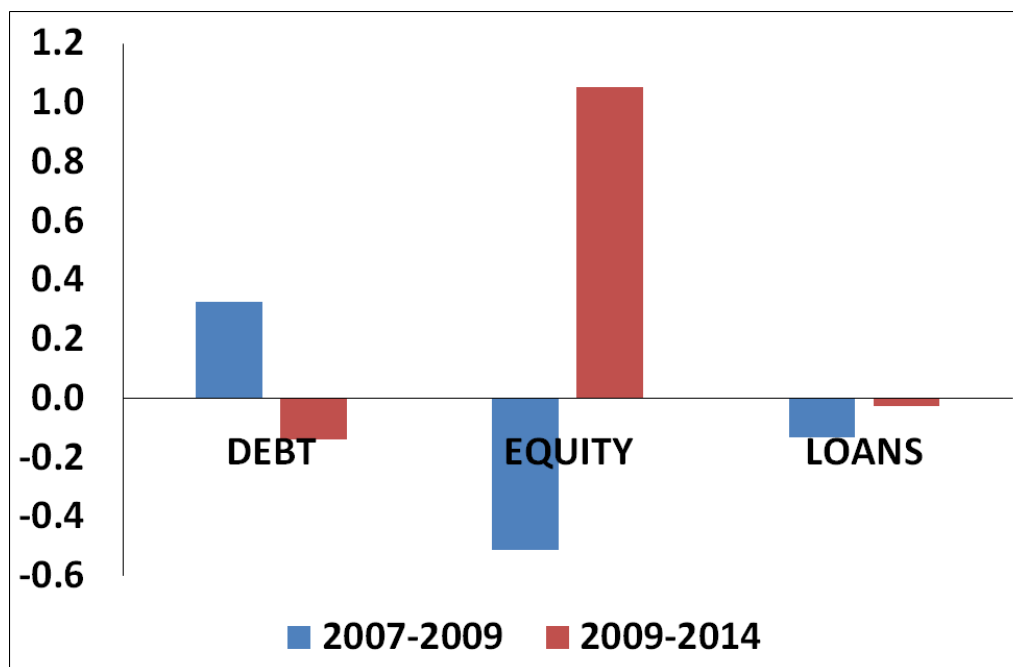
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Figure 1: Cross-Border Assets, Shares



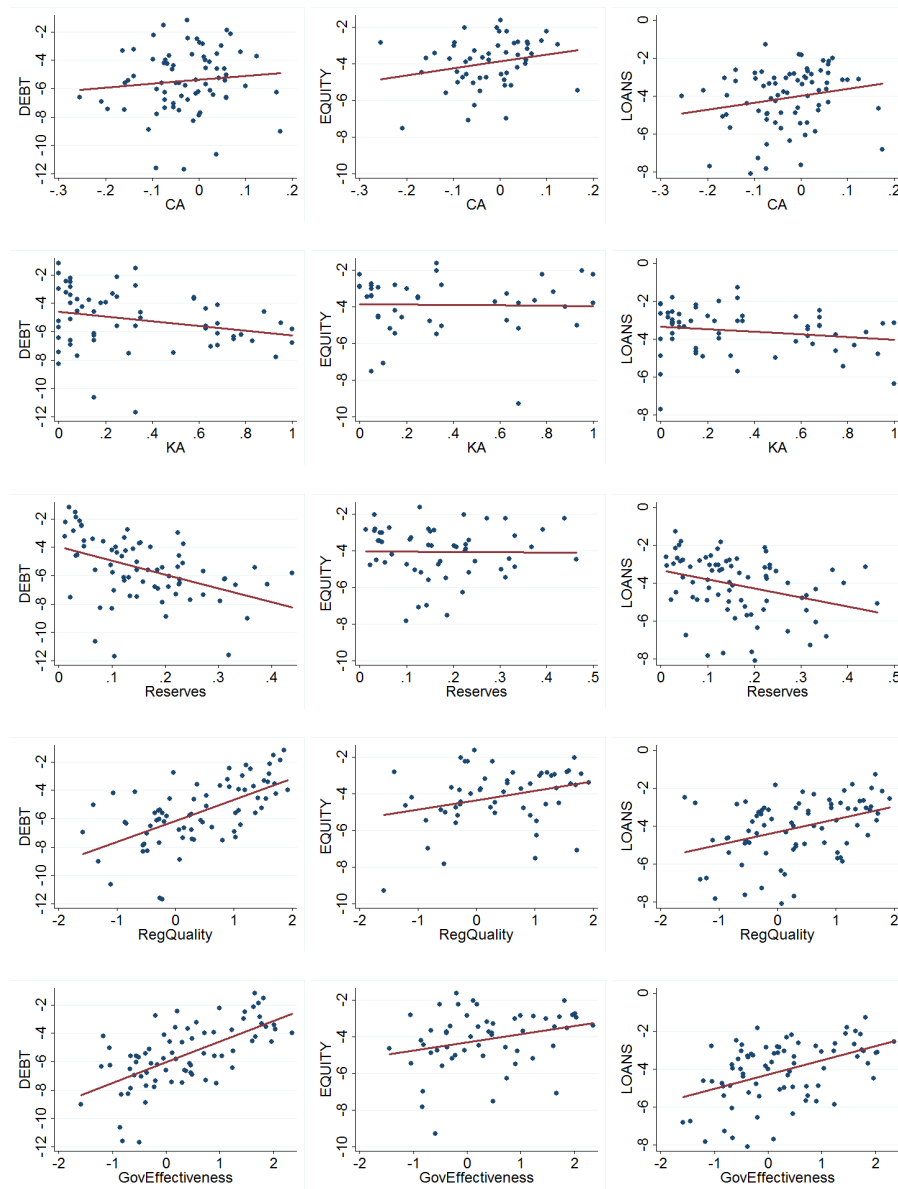
Note: Authors' calculations based on Locational Banking Statistics and CPIS data.

Figure 2: Cross-Border Assets, Growth Rates



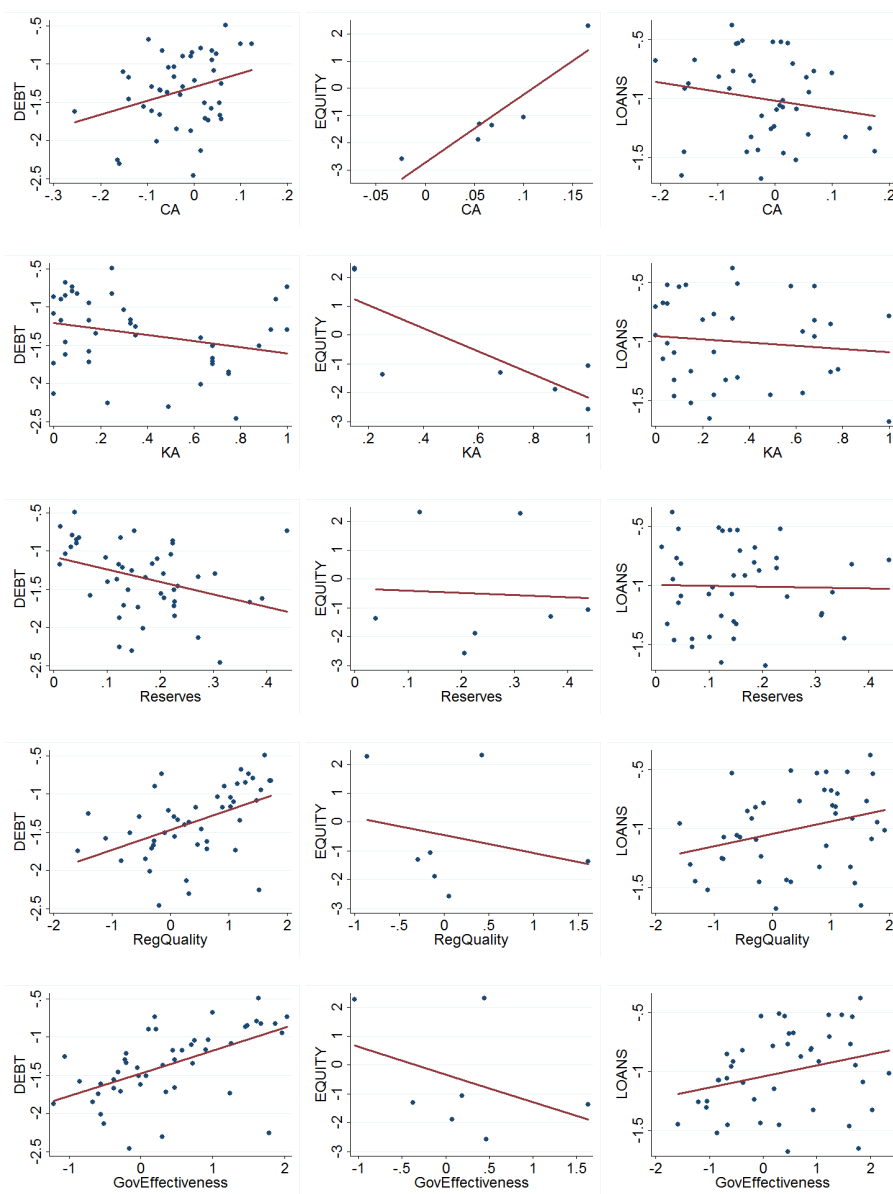
Note: Authors' calculations based on Locational Banking Statistics and CPIS data.

Figure 3: Controls and Characteristics, 2007



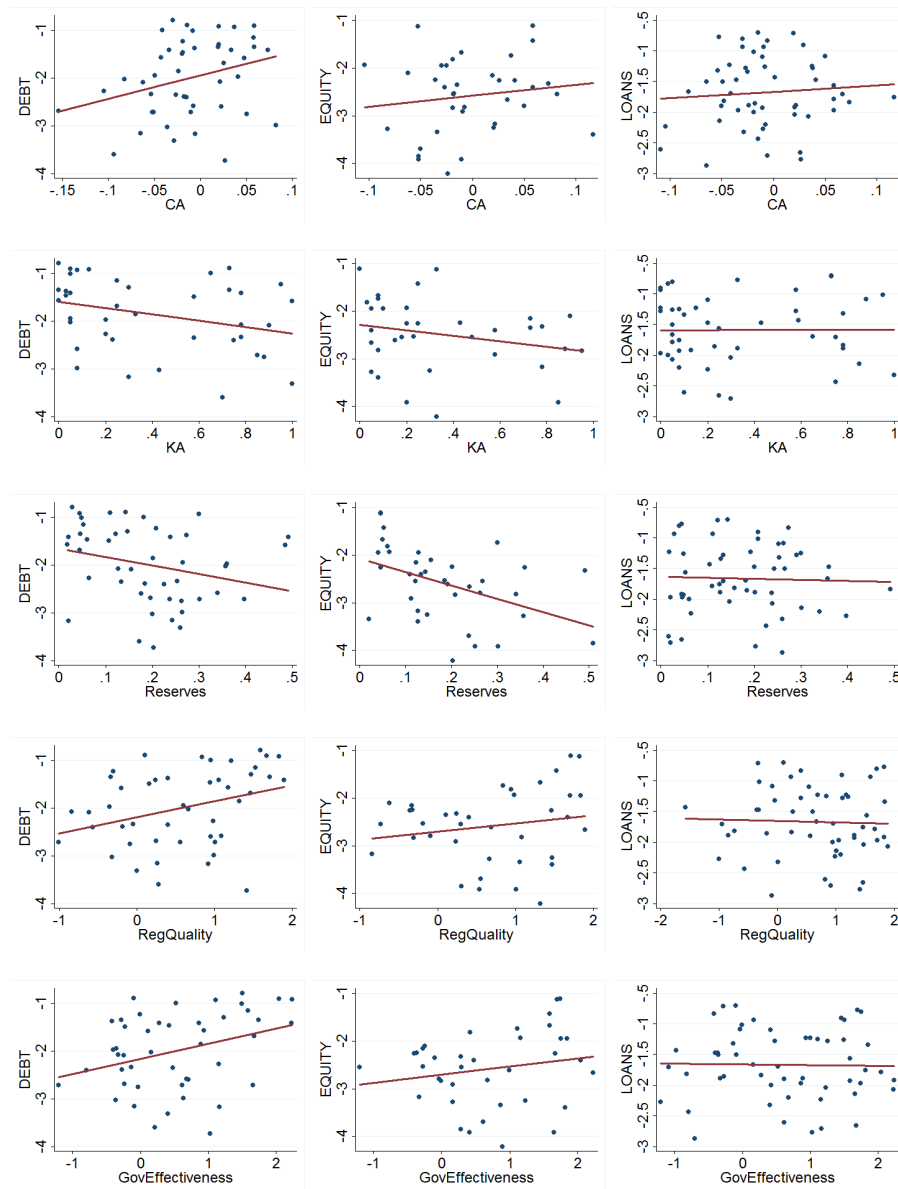
Note: The scatterplot captures the correlation between the extracted country-fixed effects (2007) and the controls (2007). CA stands for current account balance as share of GDP, KA stands for the overall capital-flow restriction index, Reserves stands for reserve assets under the control of monetary authorities as a share of GDP, RegQuality stands for regulatory quality index, GovEffectiveness stands for government effectiveness index.

Figure 4: Controls and Characteristics, 2007-2009



Note: The scatterplot captures the correlation between the extracted country-fixed effects (2007-2009) and the controls (2007). CA stands for current account balance as share of GDP, KA stands for the overall capital-flow restriction index, Reserves stands for reserve assets under the control of monetary authorities as a share of GDP, RegQuality stands for regulatory quality index, GovEffectiveness stands for government effectiveness index.

Figure 5: Controls and Characteristics, 2009-2014



Note: The scatterplot captures the correlation between the extracted country-fixed effects (2009-2014) and the controls (2009). CA stands for current account balance as share of GDP, KA stands for the overall capital-flow restriction index, Reserves stands for reserve assets under the control of monetary authorities as a share of GDP, RegQuality stands for regulatory quality index, GovEffectiveness stands for government effectiveness index.

Table 1: International Asset Holdings

	DEBT	EQUITY	LOANS
ln(Imports)	0.10 (0.05)*	0.83 (0.16)***	0.41 (0.05)***
ln(Distance)	-0.92 (0.12)***	-0.75 (0.27)***	-1.23 (0.11)***
Language	0.47 (0.23)**	0.84 (0.50)*	0.66 (0.19)***
EEA	-0.35 (0.30)	-0.14 (0.65)	-0.63 (0.36)*
Euro	1.45 (0.26)***	0.60 (0.52)	0.30 (0.24)
Obs.	808	485	611

Notes: The dependent variable is $\ln(A_{ij})$ at end of 2007. All regressions include host and source country dummies. Estimated by unbalanced SUR. ***, **, * denote significance at 1, 5 and 10 percent.

Table 2: Cross-Border Adjustment: Crisis Period

	DEBT	EQUITY	LOANS
$\ln(A_{ij07})$	-0.17 (0.02)***	-0.37 (0.04)***	-0.17 (0.02)***
$\ln(\text{Imports})$	-0.03 (0.04)	0.62 (0.15)***	0.05 (0.03)
$\ln(\text{Distance})$	-0.36 (0.10)***	-0.05 (0.23)	-0.34 (0.07)***
Language	0.44 (0.18)**	-0.56 (0.43)	0.09 (0.12)
EEA	-0.18 (0.25)	-0.78 (0.57)	-0.35 (0.22)
Euro	0.26 (0.18)	-0.37 (0.40)	0.38 (0.13)***
Obs.	621	349	500

Notes: The dependent variable is $\Delta \ln(A_{ij})$ between end of 2007 and end of 2009. All regressions include host and source country dummies. Estimated by unbalanced SUR. ***, **, * denote significance at 1, 5 and 10 percent.

Table 3: Cross-Border Adjustment: Post-Crisis Period

	DEBT	EQUITY	LOANS
$\Delta \ln(A_{ij07-09})$	-0.62 (0.05)***	-0.63 (0.05)***	-0.47 (0.05)***
$\ln(A_{ij07})$	-0.33 (0.04)***	-0.46 (0.05)***	-0.21 (0.03)***
$\ln(\text{Imports})$	0.06 (0.07)	0.34 (0.16)**	0.13 (0.06)**
$\ln(\text{Distance})$	-0.47 (0.14)***	-0.31 (0.22)	-0.36 (0.11)***
Language	-0.24 (0.23)	-0.13 (0.43)	0.21 (0.16)
EEA	0.37 (0.34)	-0.67 (0.54)	-0.08 (0.50)
Euro	0.28 (0.25)	0.48 (0.39)	0.02 (0.18)
Obs.	455	277	383

Notes: The dependent variable is $\Delta \ln(A_{ij})$ between end of 2009 and end of 2014. All regressions include host and source country dummies. Estimated by unbalanced SUR. ***, **, * denote significance at 1, 5 and 10 percent.

Table 4: Cross-Asset Correlations

	DEBT ₀₇	EQUITY ₀₇
EQUITY ₀₇	0.391	
prob.	0.005	
obs.	50	
LOANS ₀₇	0.732	0.178
prob.	0.001	0.216
obs.	50	50
	DEBT _{07–09}	EQUITY _{07–09}
EQUITY _{07–09}	0.333	
prob.	0.668	
obs.	4	
LOANS _{07–09}	0.104	0.052
prob.	0.845	0.934
obs.	6	5
	DEBT _{09–14}	EQUITY _{09–14}
EQUITY _{09–14}	0.377	
prob.	0.063	
obs.	25	
LOANS _{09–14}	0.242	0.178
prob.	0.233	0.395
obs.	26	25

Notes: The table presents the Pearson correlation coefficients between the extracted country-fixed effects for various specifications.

Table 5: Cross-Period Correlations

	DEBT ₀₇	DEBT ₀₇₋₀₉
DEBT ₀₇₋₀₉	0.408	
prob.	0.015	
obs.	35	
DEBT ₀₉₋₁₄	0.493	0.504
prob.	0.003	0.003
obs.	35	33
	EQUITY ₀₇	EQUITY ₀₇₋₀₉
EQUITY ₀₇₋₀₉	-0.933	
prob.	0.067	
obs.	4	
EQUITY ₀₉₋₁₄	0.582	-0.222
prob.	0.226	0.778
obs.	6	4
	LOANS ₀₇	LOANS ₀₇₋₀₉
LOANS ₀₇₋₀₉	0.371	
prob.	0.028	
obs.	35	
LOANS ₀₉₋₁₄	0.353	0.417
prob.	0.044	0.020
obs.	33	31

Notes: The table presents the Pearson correlation coefficients between the extracted country-fixed effects for various specifications.

Table 6: Destination Characteristics: Pre-Crisis Period

	DEBT	EQUITY	LOANS
Current account	0.103	0.233	0.195
prob.	0.393	0.097	0.095
obs.	71	52	74
Capital controls	-0.255	-0.019	-0.180
prob.	0.047	0.905	0.169
obs.	61	44	60
Reserves	-0.443	-0.014	-0.317
prob.	0.001	0.919	0.005
obs.	73	54	77
Regulatory quality	0.607	0.298	0.385
prob.	0.001	0.027	0.001
obs.	74	55	78
Gov. effectiveness	0.633	0.275	0.457
prob.	0.001	0.042	0.001
obs.	74	55	78

Notes: The table presents the Pearson correlation coefficients between the extracted country-fixed effects (2007) and the controls (2007). Current account stands for current account balance as share of GDP, Capital controls stands for the overall capital-flow restriction index, Reserves stands for reserve assets under the control of monetary authorities as a share of GDP, Regulatory quality stands for regulatory quality index, Gov. effectiveness stands for government effectiveness index.

Table 7: Destination Characteristics: Crisis Period

	DEBT	EQUITY	LOANS
Current account	0.302	0.914	-0.184
prob.	0.044	0.011	0.250
obs.	45	6	41
Capital controls	-0.271	-0.795	-0.112
prob.	0.087	0.033	0.515
obs.	41	7	36
Reserves	-0.355	-0.051	-0.019
prob.	0.016	0.913	0.903
obs.	46	7	42
Regulatory quality	0.479	-0.242	0.305
prob.	0.001	0.601	0.047
obs.	47	7	43
Gov. effectiveness	0.551	-0.398	0.280
prob.	0.001	0.377	0.070
obs.	47	7	43

Notes: The table presents the Pearson correlation coefficients between the extracted country-fixed effects (2007-2009) and the controls (2007). Current account stands for current account balance as share of GDP, Capital controls stands for the overall capital-flow restriction index, Reserves stands for reserve assets under the control of monetary authorities as a share of GDP, Regulatory quality stands for regulatory quality index, Gov. effectiveness stands for government effectiveness index.

Table 8: Destination Characteristics: Post-Crisis Period

	DEBT	EQUITY	LOANS
Current account	0.302	0.142	0.081
prob.	0.041	0.410	0.564
obs.	46	36	53
Capital controls	-0.302	-0.234	0.006
prob.	0.061	0.183	0.968
obs.	39	34	47
Reserves	-0.265	-0.447	-0.034
prob.	0.075	0.006	0.809
obs.	46	37	54
Regulatory quality	0.320	0.180	-0.035
prob.	0.030	0.286	0.802
obs.	46	37	54
Gov. effectiveness	0.328	0.189	-0.021
prob.	0.026	0.264	0.879
obs.	46	37	54

Notes: The table presents the Pearson correlation coefficients between the extracted country-fixed effects (2009-2014) and the controls (2009). Current account stands for current account balance as share of GDP, Capital controls stands for the overall capital-flow restriction index, Reserves stands for reserve assets under the control of monetary authorities as a share of GDP, Regulatory quality stands for regulatory quality index, Gov. effectiveness stands for government effectiveness index.

Appendix: Sample of Reporting Countries

The reporters are Argentina, Australia, Austria, Bangladesh, Belarus, Belgium, Bolivia, Brazil, Bulgaria, Chile, Colombia, Czech Republic, Denmark, Egypt, Estonia, Finland, France, Germany, Greece, Honduras, Hungary, Iceland, India, Indonesia, Israel, Italy, Japan, Kazakhstan, Korea, Kuwait, Latvia, Lithuania, Mexico, Mongolia, Netherlands, Norway, Portugal, Republic of Pakistan, Romania, Russian Federation, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Thailand, Turkey, Ukraine, United Kingdom, Venezuela.