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Abstract

We consider a new dataset that provides a description of the population of financial equity flows between developed countries from 2001 to 2018. We follow the standard practice of controlling for pull and push factors as well as gravity-style variables, while also accounting for the business cycle, public debt and sovereign ratings. Our key findings are as follows: (i) equity flows are more intense between countries at the same stage of the business cycle (ii) increased equity flows to countries with a relatively lower public debt deficit as a ratio of GDP (iii) financial and macroeconomic variables are important for big equity flows, while institutional variables are important for the small flows. Overall, this new dataset provides novel evidence on the importance of the business cycle, government debt and sovereign ratings scores.

JEL-Codes: C230, E440, F440, G150.

Keywords: cross-country equity flows, stock market returns, panel data, quantile regression, business cycle.

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1 Introduction

In a world where the search for funding and yields tends to drive investments, the importance of cross-country capital flows is well understood. Financial equity flows can be impacted by economic shocks such as the global financial crisis (GFC), which created a period of extreme stress in the global financial markets and banking systems between mid-2007 and early 2009. Understanding the determinants behind such financial flows is crucial.

Therefore, in this paper we answer several research questions such as: (i) How bilateral equity flows depend on factors that can be assigned to one of three broad categories: financial, macroeconomics, and institutional? (ii) Are equity flows determined by the differences in government debt between countries? (iii) Are sovereign ratings important when we seek to explain the drivers for bilateral equity flows? (iv) Are the factors affecting portfolio equity flows related to their magnitude? (v) Is there a distinction between the magnitude of international equity flows and the category of determinants that primarily drives them?

In addition, studying portfolio equity flows means notably tackling significant data issues as discussed in Koepke and Paetzold (2020). In this present paper we exploit new data for 40 economies, where each is treated as a reporter and partner over the 2001-2018 period. This provides us with 24,282 observations. This is a considerably larger sample than other studies in the research area; for example, Kemme et al. (2021) explored the determinants of equity flows with data covering 149 source countries and 34 OECD host countries, which provided 15,697 observations. Therefore, our data can be considered as a description of the population of all financial equity flows between developed countries from 2001 to 2018. With this data, we explore the features of cross-country equity flows between developed countries over the last two decades.

Our analysis of the entire sample provides baseline results that indicate that the role of financial factors is significant. On one hand, we report that flows follow the highest return, while on the other, they exhibit no pattern of risk-sharing with flows pursuing higher standard deviations of returns. The lack of risk-sharing is further heightened by flows between countries with highly correlated stock markets and experiencing the same phase of the business cycle. This result underpins the vast body of research that reports a lack of international risk-sharing as predicted by international business cycle models (Mace, 1991; Leibrecht and Scharler, 2008; Kose et al., 2009; Pierucci and Ventura, 2010; Lewis and Liu, 2015; Fuleky et al., 2018; Dufrénot et al., 2020). We also find evidence supporting the role of the overall current account position, as well as bilateral imports and exports. The importance of the indebtedness of a country is, however, conditional on the sovereign rating status of the economy. We also find a significant role for the institutional factors in driving bilateral portfolio equity flows.

Nonlinearities present in the examined data motivated us to resort to quantile regression. In this analysis, we find that the importance of broadly defined groups of determinants is conditional on the size of the underlying flows. For the inflows and outflows of the highest magnitudes, financial factors, current account position, and

degree of business cycle synchronization play a major role. Moreover, at the top and bottom quantiles of the flow sizes we find that risk-sharing behavior can be observed, while there is no evidence of risk-sharing behavior in the middle quantiles. The middle quantiles of the bilateral flows are dominated by institutional factors: capital controls, political stability, and availability of information. We also see that in contrast to the Lucas (1990) paradox, portfolio equity flows from richer to poorer countries. Moreover, the results are significant only for inflows, indicating that capital not only flows to poorer countries but it stays there.

The remainder of this paper is laid out as follows. Section 2 reviews the related literature, Section 3 discusses the methodology, estimation and data. The empirical results are discussed in Section 4. This includes the results for the main sample, sub-samples as well as semi-parametric and quantile regressions. Section 5 concludes.

2 Literature Review

The early 20th and early 21st century are periods marked with very different trends in capital flows. Schularick (2006) show that flows from developed to developing countries were increasingly important in the early 20th century, but this is not the case in the 21st century as capital flows from developed to developing countries flattened out. Capital flows have also been the focus of concern when considering the risks associated with exchange rate fluctuations, capital that moves quickly and frequently (for further discussion on 'hot money' see Yan (2018) and on detecting surges in flows see Kaya et al. (2020)) as well as the loss of monetary control (Binici et al., 2010). These issues have led to a literature that explores the determinants of equity flows, where global/external (push) and country-specific (pull) factors are used to categorise the independent variables used in modelling exercises (see Koepke (2019); Levy Yeyati and Zúñiga (2015) for reviews of the equity flows literature).

Typically, global factors include the general level of risk (negative relationship expected), interest rates (negative relationship expected) and international productivity levels (positive relationship expected), where the reference country group tends to be large developed countries. Promoted by various crises, push factors began to attract more interest in the 1990s. On the other hand, pull factors such as country-specific risks (negative relationship expected), rates of return (positive relationship expected) and productivity (positive relationship expected) were the focus of studies before the 1990s. During the GFC, this framework was also supplemented by 'shock' factors. Since the emergence of the push-pull framework in the 1990s, researchers began to consider the relative importance of these types of factors; Fernandez-Arias (1996) provided an early contribution to this literature, where they concluded that global factors were more dominant. More recently, Sarno et al. (2016) examined flows from the US to another 55 destinations and concluded that global factors appear more important than country-specific factors in explaining flows. Fratzscher (2012) also find that global factors were generally of most importance during the financial crisis. Moreover, Mandalinci and

Mumtaz (2019) find support for the push-pull framework and conclude that regional variations are more important than global variations in explaining portfolio capital flows to emerging economies.

While the traditional push-pull framework remains popular, these factors have also increasingly been complemented by gravity-style variables and other variables that cannot easily be categorised into push/pull (e.g. contagion effects). Araujo et al. (2017); Everett and Galstyan (2020); Obstfeld and Rogoff (2001); Portes et al. (2001) and Portes and Rey (2005) have demonstrated that the gravity model can explain financial flows as well as trade flows. As an example, a typical gravity variable is distance, where in a trade context this proxies for trade costs. In the context of capital flows, greater distance suggests less market information on which to base investment decisions. This has prompted the international capital flow literature to consider a range of institutional variables (Lothian, 2006; Montiel and Reinhart, 1999; Neumann et al., 2009). Therefore, the analysis in this paper controls for a range of gravity-style factors as well as traditional push and pull variables in three main categories (i) we control for financial factors with our variables related to stock market indices and also split our sample according to sovereign rating scores (ii) institutional factors are accounted for via measures of capital controls and institutional quality (iii) macroeconomic factors are controlled for by variables for trade, public debt, exchange rates and GDP. We have two avenues of particular interest. Firstly, we examine whether the influence of a specific determinant of portfolio equity flows is conditional on the magnitude and direction of the flows using a quantile regression approach. Secondly, we focus our attention on novel factors, such as business cycle synchronization, government debt and sovereign rating scores. Both aspects are under-explored in the literature.

There is research considering the impact of European Central Bank monetary policies on stock markets (Haitsma et al., 2016) as well as the impact of fiscal and monetary shocks on stock market performance (Afonso and Sousa, 2011; Chatziantoniou et al., 2013). Furthermore, there is also some evidence of a link between capital flows and global business cycles (Kose et al., 2008, 2012; Eller et al., 2020). However, to the best of our knowledge there is very limited consideration of the impact of business cycle synchronisation on bilateral equity flows. We also specifically consider whether there are different effects depending on sovereign rating scores. Similarly, there is limited research considering this dimension to explain cross-country bilateral equity flows; for exceptions, see Kim and Wu (2008) who consider the long-term effect of sovereign rating scores on equity flows to emerging economies, and Christopher et al. (2012) who explore the connection between regional stock market co-movements and sovereign rating scores for emerging economies. There is also only a limited amount of research examining the related issue of the impact of sovereign rating scores on international banking flows (Kim and Wu, 2008). Thirdly, the recent work of Wisniewski and Jackson (2021) suggests a negative relationship between the government debt-to-GDP ratio and stock market returns. This is also a very under-explored area, with older contributions, such as the research based on Canadian data by Darrat (1990).

Therefore, the contribution of this paper is three-fold. Firstly, we adopt a richer dataset that allows us to examine bilateral equity flows across developed countries over the last two decades. Secondly, we examine the importance of both countries being at the same or different stages of the business cycle, differences in government debt and their sovereign rating scores. These aspects are individually under-explored and to the best of our knowledge, there is a lack of empirical research considering the three factors in the context of developed country bilateral equity flows. Finally, we consider the effects of the examined determinants on different magnitudes and directions of portfolio equity flows. This, in turn, enables us to demonstrate when a given group of factors has the most profound impact on bilateral capital flows. Interestingly, other research has stressed that different types of capital flows is driven by different sets of factors (Brafu-Insaidoo and Biekpe, 2014; Ibarra and Tellez-Leon, 2020), however, none of the research thus far has considered differences in the magnitudes of the flows.

3 Methodology

3.1 Data and variables under investigation

The dataset used to construct the dependent variable comes from Finflows database (Nardo et al., 2017). This research utilizes data on annual portfolio equity inflows over the period 2001-2018 between the following 40 economies[1]: Austria, Australia, Belgium, Canada, Switzerland, Chile, Czechia, Germany, Estonia, Spain, Finland, France, Greece, Hong Kong, Hungary, Ireland, Iceland, Italy, Japan, Korea, Lebanon, Lithuania, Luxembourg, Latvia, Malta, Mauritius, Mexico, Netherlands, Norway, New Zealand, Panama, Poland, Portugal, Romania, Sweden, Singapore, Slovakia, Turkey, the UK, and the USA. With 40 countries there is a total of 1560 pairs of countries, where each country is treated as a reporting country and a partner country. However, due to missing observations, in this research we utilize the data on 1349 country pairs. Therefore, the total number of observations amounts to 18*1349=24282. The list of missing country pairs is displayed in Appendix A. In this setting, variable $PEinflows_{ijt}$ is defined as portfolio equity inflow to country i from country j in year t. Moreover, we explore potential determinants of portfolio equity inflows that can be divided into the following three main categories: financial factors, institutional factors, and macroeconomic factors.

3.1.1 Financial factors

Financial factors are derived from the classical Markowitz model and are associated with means, standard deviations, and correlation of returns on stock indices. To calculate the measures, we obtained monthly data on the values of major stock indices expressed in US dollars[2] in the examined countries for 2000-2018 period.

[1]The group that, using the nomenclature from The Economist, could be called "mostly developed economies".

[2]We ran robustness checks using values expressed in local currency. The results are available in appendices C, D, and E

The list of all stock market indices used in the analysis can be found in Appendix B. Data on stock market returns comes from Thompson Reuters database. As the data on current values of returns is not known to the investors, we are using the lagged values in the research[3]. Utilization of the lagged values additionally helps with resolving the endogeneity issues, as current flows might influence the value of the returns. Within this setting we constructed three financial variables. Difference in mean returns is defined as:

$$Rdif_{ijt} = MR_{it} - MR_{jt} \tag{1}$$

where: MR_{it} and MR_{jt} are mean monthly returns calculated over the 12 month period, between stock indices in country i and country j, respectively, in year t[4]. Difference in standard deviations is calculated as:

$$SDdif_{ijt} = SDR_{it} - SDR_{jt} \tag{2}$$

where: SDR_{it} and SDR_{jt} are standard deviations of monthly returns calculated over the 12 month period, between stock indices in country i and country j, respectively, in year t[5]. Finally, Cor_{ijt} denotes correlation coefficient of monthly returns calculated over the 12 month period, between stock indices in country i and country j, respectively, in year t. The percentiles of the dependent variable, as well as the financial variables are depicted in Figure 1 and Figure 3.

[3]Using contemporary values produces quantitatively similar results as reported here.
[4]We obtained qualitatively similar results using a logarithmic specification: $\ln[(MR_{it}+1)/(MR_{jt}+1)]$.
[5]We obtained qualitatively similar results using a logarithmic specification: $\ln[(SDR_{it})/(SDR_{jt})]$.

Figure 1: Percentiles of the distribution of portfolio equity flows and correlations of returns over time

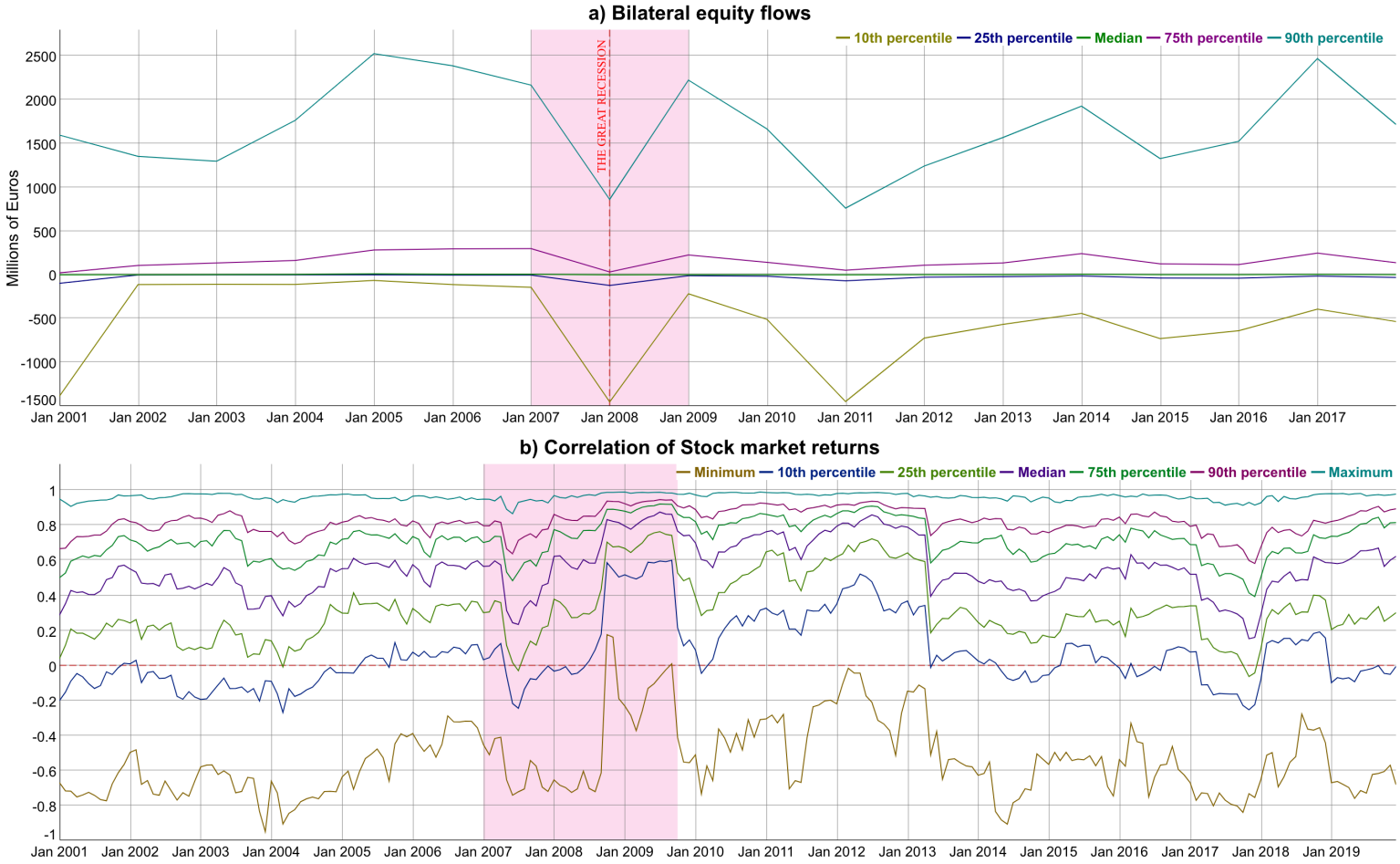
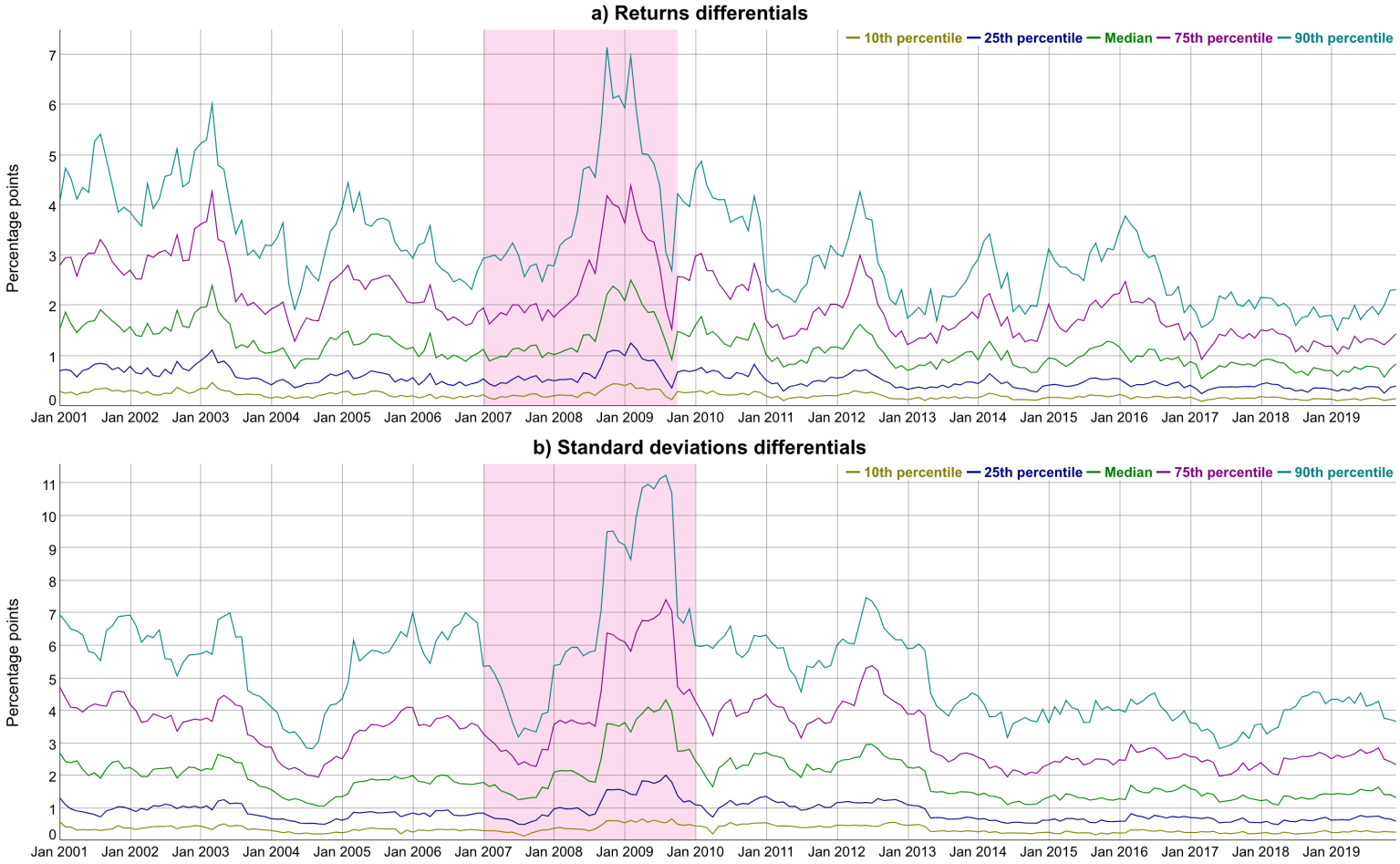


Figure 2: Percentiles of the distribution of mean returns and standard deviations over time



3.1.2 Institutional factors

The first institutional factor is the degree of capital controls between examined countries. To construct this variable, we utilized the Chinn and Ito (2006) database on de jure measures of financial openness. The measure of financial openness in this database (FO_{it}) for a given country i takes values from 0 (indicating no capital mobility) to 1 (indicating perfect capital mobility). As the capital mobility between pairs of countries depends on the degree of controls in both countries, we define the bilateral measure of capita controls as:

$$CapControls_{ijt} = FO_{it} * FO_{jt} \tag{3}$$

The advantage of using a product lies in the fact that the measure is bound between 0 and 1, and can take the value of 0, even if one of the countries is characterized by perfect capital mobility, while the other imposes prohibitive capital controls.

For the construction of another four measures of institutional quality, we utilized the World Bank Worldwide Governance Indicators database. In order to construct these measures we used two indicators available in this database. The first of them is the Voice and Accountability measure, which besides freedom of expression and freedom of association, captures the availability of information to citizens, which can be crucial for making informed decisions about international investments. The values of these measures for reporter and partner country, $RapVaA_{it}$ and $ParVaA_{jt}$, respectively, serve as proxies for the availability of information. The second variable from the database we use is Stability and Absence of Violence that represents the stability of the political system and proxies the probability that the investment can be appropriated by the new government. We construct the measure for both reporter and partner country, $RapStab_{it}$ and $ParStab_{jt}$, respectively.

3.1.3 Macroeconomic factors

The third group of examined variables we consider are macroeconomic variables. Firstly, we examined the impact of bilateral imports and exports expressed as a share of the reporting country's GDP, $Import_{ijt}$ and $Export_{ijt}$, respectively. We also examine the impact of the current account position of the reporting country expressed as a share of GDP, CA_{it}. In addition, we explore the role of

government debt, by calculating the following variable:

$$DBdif_{ijt} = Debt_{it} - Debt_{jt} \tag{4}$$

where $Debt_{it}$ and $Debt_{jt}$ are the debt-to-GDP ratios in country i and country j, respectively, in year t. To establish the impact of exchange rate volatility on portfolio equity flows we used the data on monthly bilateral nominal exchange rate. Then we calculated the measure of exchange rate volatility as:

$$Exchange_{ijt} = \frac{SD(BiER_{ijt})}{M(BiER_{ijt})} \tag{5}$$

where: SD and M denote, standard deviation and mean, while $BiER_{ijt}$ is a series of monthly bilateral exchange rates between country i and country j, in year t. The division of the standard deviation by the mean has the advantage of expressing the volatility as a percentage deviation from the mean, thus facilitating better comparisons between pairs of countries with high and low absolute levels of bilateral exchange rates.

Moreover, we examine the role of the difference in the level of development using the difference in the level of GDP per capita. The measure is calculated as:

$$GDP_{pc}dif_{ijt} = GDP_{pc_{it}} - GDP_{pc_{jt}} \tag{6}$$

where $GDP_{pc_{it}}$ and $GDP_{pc_{jt}}$ is GDP per capita of country i and country j, respectively, in year t[6]. In order to establish the role of business cycle synchronization in determining the size of portfolio flows, we first collected that data on real GDP and used the Hodrick-Prescott filter to calculate the output gaps. The dummy variables BCS_{ijt} takes the value of 1, when both countries i and j have positive or negative output gaps in in year t, and 0 otherwise. In the case of the semi-parametric regressions, where utilization of the binary variable is inappropriate, we used a measure of business cycle co-movement defined as:

$$GAPdif_{ijt} = GAP_{it} - GAP_{jt} \tag{7}$$

where GAP_{it} and GAP_{jt} are the output gaps in country i and country j, respectively in year t.

[6]We obtained qualitatively similar results using a logarithmic specification: $\ln\left[(GDP_{pc_{it}})/(GDP_{pc_{jt}})\right]$.

Finally, to control for the sizes of the examined economies we use the product of GDPs in country i and country j, respectively, in year t, $GDPprod_{ijt}$. The data on macroeconomic variables comes from the IMF Directions of Trade, IMF World Economic Outlook, IMF International Financial Statistics, and Penn World Table.

3.2 Estimation strategy

Regarding our estimation strategy, we estimate the following equation as our baseline:

$$\begin{aligned} PEinflows_{ijt} = {} & \beta_1 Rdif_{ijt-1} + \beta_2 SDdif_{ijt-1} + \beta_3 Cor_{ijt-1} \\ & + \beta_4 RepStab_{it} + \beta_5 ParStab_{jt} + \beta_6 RepVaA_{it} + \beta_7 ParVaA_{jt} \\ & + \beta_8 CapControls_{ijt} + \beta_9 Import_{ijt} + \beta_10 Export_{ijt} + \beta_11 CA_{it} \\ & + \beta_12 DBdif_{ijt} + \beta_13 BCS_{ijt} + \beta_14 Exchange_{ijt} \\ & + \beta_15 GDP_{pc}dif_{ijt} + \beta_16 GDPprod_{ijt} + \eta_{ij} + \zeta_t + \varepsilon_{ijt} \end{aligned} \tag{8}$$

where the abbreviations of all the variables were explained in the previous subsection, η_{ij} is the country-pair specific fixed effect, ζ_t is the time effect, and ε_{ijt} denotes the stochastic component. As mentioned earlier, we are using lagged values for $Rdif$, $SDdiff$, and Cor, as information about the contemporary values of mean returns, standard deviations, and correlations, is not available to the agents making the trade. Additionally, the use of the lagged variables solves the problem of endogeneity between the portfolio flows, and the aforementioned variables.

We proceed with the estimations in three steps. Firstly, we estimate only the financial equation:

$$PEinflows_{ijt} = \beta_1 Rdif_{ijt-1} + \beta_2 SDdif_{ijt-1} + \beta_3 Cor_{ijt-1} + \eta_{ij} + \zeta_t + \varepsilon_{ijt} \tag{9}$$

denoted as Model 1. The next two considered variants add all macroeconomic variables, however they differ in the use of the institutional variables. In the first variant, Model 2, we use only variables

associated with political stability:

$$\begin{aligned} PEinflows_{ijt} = {} & \beta_1 Rdif_{ijt-1} + \beta_2 SDdif_{ijt-1} + \beta_3 Cor_{ijt-1} \\ & + \beta_4 RepStab_{it} + \beta_5 ParStab_{jt} \\ & + \beta_8 CapControls_{ijt} + \beta_9 Import_{ijt} + \beta_1 0 Export_{ijt} + \beta_1 1 CA_{it} \\ & + \beta_1 2 DBdif_{ijt} + \beta_1 3 BCS_{ijt} + \beta_1 4 Exchange_{ijt} \\ & + \beta_1 5 GDP_{pc} dif_{ijt} + \beta_1 6 GDPprod_{ijt} + \eta_{ij} + \zeta_t + \varepsilon_{ijt} \end{aligned} \tag{10}$$

while in the second variant, Model 3, we consider institutional variables associated with availability of information:

$$\begin{aligned} PEinflows_{ijt} = {} & \beta_1 Rdif_{ijt-1} + \beta_2 SDdif_{ijt-1} + \beta_3 Cor_{ijt-1} \\ & + \beta_6 RepVaA_{it} + \beta_7 ParVaA_{jt} \\ & + \beta_8 CapControls_{ijt} + \beta_9 Import_{ijt} + \beta_1 0 Export_{ijt} + \beta_1 1 CA_{it} \\ & + \beta_1 2 DBdif_{ijt} + \beta_1 3 BCS_{ijt} + \beta_1 4 Exchange_{ijt} \\ & + \beta_1 5 GDP_{pc} dif_{ijt} + \beta_1 6 GDPprod_{ijt} + \eta_{ij} + \zeta_t + \varepsilon_{ijt}. \end{aligned} \tag{11}$$

Finally, the last specification, Model 4, considers only those institutional variables that were statistically significant in Model 2 or Model 3. In the main results, Model 4 takes the form:

$$\begin{aligned} PEinflows_{ijt} = {} & \beta_1 Rdif_{ijt-1} + \beta_2 SDdif_{ijt-1} + \beta_3 Cor_{ijt-1} \\ & + \beta_4 RepStab_{it} + \beta_7 ParVaA_{jt} \\ & + \beta_8 CapControls_{ijt} + \beta_9 Import_{ijt} + \beta_1 0 Export_{ijt} + \beta_1 1 CA_{it} \\ & + \beta_1 2 DBdif_{ijt} + \beta_1 3 BCS_{ijt} + \beta_1 4 Exchange_{ijt} \\ & + \beta_1 5 GDP_{pc} dif_{ijt} + \beta_1 6 GDPprod_{ijt} + \eta_{ij} + \zeta_t + \varepsilon_{ijt}. \end{aligned} \tag{12}$$

However, in the sub-samples, Model 4 is specified differently, depending on the results obtained for Models 2 and 3.

Furthermore, we examine whether the results obtained using the entire sample hold up in several sub-samples. Firstly, we consider splitting the sample between pairs of countries associated with different sovereign rating categories. In Table 1, and following Afonso et al. (2014), we explain the

Table 1: Sovereign Ratings

Characterization of debt and issuer (source: Moody's)		Rating			
		S&P	Moody's	Fitch	Scale
Highest quality	Investment grade	AAA	Aaa	AAA	17
High quality		AA+	Aa1	AA+	16
		AA	Aa2	AA	15
		AA-	Aa3	AA-	14
Strong payment capacity		A+	A1	A+	13
		A	A2	A	12
		A-	A3	A-	11
Adequate payment capacity		BBB+	Baa1	BBB+	10
		BBB	Baa2	BBB	9
		BBB-	Baa3	BBB-	8
Likely to fulfil obligations, ongoing uncertainty	Speculative grade	BB+	Ba1	BB+	7
		BB	Ba2	BB	6
		BB-	Ba3	BB-	5
High credit risk		B+	B1	B+	4
		B	B2	B	3
		B-	B3	B-	2
Very high credit risk		CCC+	Caa1	CCC+	1
		CCC	Caa2	CCC	
		CCC-	Caa3	CCC-	
Near default with possibility of recovery		CC	Ca	CC	
				C	
Default		SD	C	DDD	
		D		DD	
				D	

Source: The authors

quantitative rating scale, from 1 (lowest quality) to 17 (highest quality, AAA), used to categorize the respective qualitative ratings from the three main rating agencies (Moody's, SP and Fitch).

Hence, the sample is divided into pairs characterized by AAA rating alone, pairs with rating below AAA, and pairs where one of the countries has above AAA rating while the other one is below AAA. Secondly, in appendix F we present the results of the split based on investment grade rating, i.e., BBB or higher. In this case, the sample is divided into a sample of pairs with both countries characterized by investment grade, pairs with both countries below investment grade, and the pairs where one country has investment grade, and the other country has not.

Finally, we divide the sample into two consecutive sub-periods: from 2001 to 2009, and from 2010 to 2018, which accounts for the potential relevance of the GFC.

To examine possible nonlinearities in the way the determinants influence portfolio equity flows we have used a semi-parametric regression approach (Ruppert et al., 2003). Consequently, we estimated equations of the form:

$$PEinflows_{ijt} = f\left(Y_{ijt}\right) + \sum_{q=1}^{15} \delta_q X_{ijt}^{q} + \eta_{ij} + \zeta_t + \vartheta_{ijt} \tag{13}$$

where Y_{ijt} denotes the observation of a chosen variable from the 16 described above, X_{ijt}^{q} is one of the 15 remaining variables, indexed by q, used as linear controls. η_{ij} is the country-pair specific fixed effect, ζ_t is the time effect, and ϑ_{ijt} denotes the stochastic component. $f()$ denotes a function fitted using radial basis functions (French et al., 2001), which is a generalization of the penalized spline smoother (Eilers and Marx, 1996; Ruppert and Carroll, 2000). The smoothing parameters selection is performed using restricted maximum likelihood, and $\hat{f}(Y_{ijt})$ is obtained with estimated best linear unbiased prediction (Robinson, 1991).

We have estimated our main equation (12) resorting to a quantile regression. The main advantage of a quantile regression approach relies on the analysis of the relationships of explained and explanatory variables outside the average values of the data, allowing, at the same time, for analyzing possible non-linear relationships between the set of explanatory factors and the variable of interest. Consequently, the purpose of resorting to this methodology is to disclose heterogeneous impacts of financial, institutional and macroeconomic variables over PEflows. Therefore, we divided our sample in ten quantiles, from the highest portfolio equity outflows (negative Peflows) to the highest portfolio equity inflows (positive Peflows), where this variable is a function of the above mentioned financial, institutional and macroeconomic factors.

4 Empirical Results

4.1 Main results

The main results from the full sample are shown in Table 2. Starting with the financial variables, the estimates suggest that equities are purchased in countries with higher rates of return, along the lines predicted by the classical Markovitz model. However, against the prediction of the Markovitz portfolio analysis model the money flows to countries with higher standard deviations of rates of return, and between countries with highly correlated rates of return. Consequently, we do not see a behavior that could be described as risk-sharing, on the contrary, we see behavior that could be described as risk seeking, and where investors tend to "hunt for yield" and chase investments with higher yields.

In terms of macroeconomic variables, we see that the portfolio equity holdings by foreigners increase in countries with a current account deficit, and in countries with a relatively lower debt-to-GDP

Table 2: Main results

Variable	Model 1		Model 2		Model 3		Model 4	
Rdif	6205	**	6346	**	5284	**	5594	**
	(2509)		(2483)		(2491)		(2486)	
SDdif	8772	***	9582	***	7729	***	8673	***
	(1490)		(1549)		(1542)		(1545)	
Cor	2066	***	577	***	491	**	419	**
	(174)		(190)		(195)		(193)	
CA			-1357	***	-837	**	-1197	***
			(366)		(361)		(367)	
CapControls			1537	***	1483	***	1209	***
			(196)		(202)		(199)	
Exchange			3009		3108		3085	
			(1977)		(1977)		(1976)	
RepStab			367	***			400	***
			(90)				(90)	
ParStab			2.34					
			(86)					
RepVoice					-16.52			
					(113)			
ParVoice					444.1	***	483.3	***
					(106.3)		(106.2)	
Export			28920	***	28260	***	28770	***
			(4781)		(4777)		(4767)	
Import			23060	***	22740	***	21600	***
			(4435)		(4435)		(4440)	
GDPpcdif			-0.00	***	-0.00	***	-0.00	***
			(0.00)		(0.00)		(0.00)	
BCS			333	***	340.8	***	348.3	***
			(109)		(108.6)		(108.6)	
Debtdif			-9.90	***	-9.77	***	-9.96	***
			(2.97)		(2.96)		(2.96)	
GDPprod			0.00	***	0.00	***	0.00	***
			(0.00)		(0.00)		(0.00)	
Sample size	24282							

Standard errors are in parentheses; */**/*** denotes coefficient statistically significant at 0.9/0.09/0.99 level. All models were estimated with country-pair and time fixed effects estimator.

ratio, highlighting the relevance of sounder fiscal policies for such investment decisions. Both results are in line with the standard international macroeconomics proposals. We also find intensified equity purchases between countries with larger trade flows, as both exports and imports, as shares of GDP, contribute positively to those flows. Moreover, equity flows are more intense between countries in the same phase of the business cycle. This reinforces the case against risk sharing taking place, which is also against predictions of international business cycle theory. Another macroeconomic variable with significant results is the GDP per capita difference. Here we find that capital flows from richer to poorer countries – contrary to the Lucas paradox.

When it comes to institutional variables, there are three results to highlight. Firstly, we observe higher capital flows between countries characterized by higher capital mobility. Secondly, we see higher inflows to countries characterized by higher political stability, and finally we see higher inflows from countries characterized by higher "Voice and Accountability", which proxies for the availability of information. Finally, the product of the GDPs of the two countries is always significant. This serves as a control for the size of the economies, as our variables of interest are total flows.

4.2 Results from sub-samples

4.2.1 Sovereign ratings

We are also interested in exploring whether sovereign ratings are important when we seek to explain the drivers for bilateral equity flows. Therefore, we divide our sample according to whether the bilateral equity flows are between countries both with a AAA rating, both with a below AAA rating, or one country with a AAA rating and the other a below AAA rating. While the main results suggest that equities are generally purchased in countries with higher rates of return, the sub-sample results in Table 3 indicate that it is in the country-pairs that both have a sovereign rating below AAA (Table 3, panel b) that tend to purchase equities in countries with a higher rate of return. There is little evidence for the relevance of the differences in returns for the sub-sample of countries with an AAA rating (panel a), or for the group where flows are between an AAA rated country and a below AAA rated country (panel c). The correlation of stock market indices remains significant in the case where bilateral equity flows are between countries both with a AAA rating (panel a) and both with a below AAA rating (panel b), but not in the case where one country has a AAA rating and the other has a below AAA rating (panel c). In addition, the difference in variances remains important in all sub-samples, again indicating risk seeking.

The first macroeconomic variable, CA, which is the current account position of the reporting country as a share of GDP, is not significant when bilateral equity flows are between countries both with a AAA rating or both with a below AAA rating. However, in the case where one country has a AAA rating and the other a below AAA rating (panel c), we find that CA is negative and significant, as was the case in the main results. Therefore, portfolio equity holdings increase in countries with a current account deficit when there is a difference in the sovereign rating of the two countries. Additionally, our earlier finding, from the baseline results, was that equity flows are more intense between countries in the same phase of the business cycle. However, the results by sub-sample suggest that this is only the case when equity flows are between countries both with a below AAA rating. Furthermore, we see that cross-country capital flows are explained by the existence of a relatively lower debt-to-GDP ratio only when we consider countries both with a below AAA rating, or one country with a AAA rating and the other a below AAA rating. The insignificant result for countries both with a AAA rating (Table 3, panel a) makes intuitive sense, since typically such

countries should depict a better fiscal position, a key feature for the rating agencies. Similarly intuitive results are found when referring to the difference in GDP per capita, which is significant only in the case where one country has a AAA rating and the other a below AAA rating.

Turning to institutional factors, we observe higher capital flows between countries characterized by higher capital mobility in the case of both countries having a below AAA rating (Table 3, panel b), or one country with a AAA rating and the other a below AAA rating (panel c). For countries both with a AAA rating, capital controls are usually equal to 1, meaning that there are no barriers to capital movements and therefore the insignificant result is expected. We do not find a significant link between equity flows and political stability when both countries have a AAA rating. However, the result from our main findings, which was that higher inflows to countries characterized by higher political stability, remains valid in the case of the other two categories. Finally, we see higher inflows from countries characterized by higher "Voice and Accountability", which proxies for the availability of information, is only important when one country has a AAA rating and the other a below AAA rating (Table 3, panel c).

Table 3: Results from sub-samples: sovereign ratings

Subsample	Flows between AAA rating countries								Flows between below AAA rating								Flows between AAA and below AAA rating							
Variable	Model 1		Model 2		Model 3		Model 4		Model 1		Model 2		Model 3		Model 4		Model 1		Model 2		Model 3		Model 4	
Rdif	22892		22490		28060	*	22640		6973	**	6492	*	5987	*	6676	*	3826		3383		1817		2090	
	(15760)		(15950)		(15900)		(15900)		(3458)		(3417)		(3423)		(3414)		(3550)		(3528)		(3543)		(3534)	
Sddif	20113	**	16620	*	21300	**	16710	*	6524	***	6997	***	5639	***	7486	***	10964	***	10740	***	8905	***	9747	***
	(9448)		(9851)		(9796)		(9823)		(2052)		(2127)		(2122)		(2099)		(2108)		(2221)		(2207)		(2215)	
Cor	5751	***	2539	**	2415	*	2536	**	2225	***	880	***	903	***	903	***	1287	***	68		-101		-146	
	(920)		(1230)		(1263)		(1230)		(260)		(275)		(279)		(274)		(246)		(266)		(271)		(269)	
CA			-1877		-1740		-1860				1013		1659	**	961				-1997	***	-1499	***	-1750	***
			(1170)		(1167)		(1162)				(669)		(667)		(668)				(475)		(469)		(476)	
CapControls			2064		-167		2136	*			1498	***	1786	***	1609	***			1618	***	1433	***	1232	***
			(1324)		(1257)		(1197)				(279)		(291)		(267)				(273)		(277)		(276)	
Exchange			17390	*	15990		17430	*			2064		1793		1982				2771		2853		2614	
			(10550)		(10570)		(10540)				(2770)		(2774)		(2769)				(2797)		(2793)		(2793)	
RepStab			71.9								564	***			555	***			282,6	**			348	***
			(566.8)								(127)				(127)				(129)				(128)	
ParStab			-2073	***			-2068	***			176								160					
			(496)				(494)				(124)								(124)					
RepVoice					319								-881								53			
					(453)								(184)								(151)			
RepVoice					484								239								670	***	718	***
					(421)								169,2								(142)		(142)	
Export			78650	***	72570	***	78410	***			17010	*	17150	*	17800	*			13950	**	13950	**	14310	**
			(12130)		(11950)		(11980)				10200		10210		10190				(6145)		(6138)		(6123)	
Import			21260	*	32960	***	21360	*			47880	***	49470	***	47690	***			11190	**	9563	*	8796	
			(11540)		(11210)		(11510)				9313		9320		9313				(5697)		(5692)		(5695)	
GDPpcdif			-0.00		-0.00		-0.00				-0.00		-0.00		-0.00				-0.00	**	-0.00	***	-0.00	**
			(0.00)		(0.00)		(0.00)				(0.00)		(0.00)		(0.00)				(0.00)		(0.00)		(0.00)	
BCS			54.6		7.1		56.5				607,9	***	611,1	***	609,6	***			107		126		141	
			(424)		(425)		(423)				161,8		161,9		161,8				(151)		(151)		(151)	
Debtdif			0.01		13.79		0.39				-15,26	***	-14,44	***	-15,53	***			-9.08	**	-10.80	**	-10.53	**
			(15.53)		(14.96)		(15.23)				4,081		4,094		4,077				(4.40)		(4.42)		(4.41)	
GDPprod			0.00	***	0.00	***	0.00	***			0.00	***	0.00	***	0.00	***			0.00	***	0.00	***	0.00	***
			(0.00)		(0.00)		(0.00)				(0.00)		(0.00)		(0.00)				(0.00)		(0.00)		(0.00)	
Sample size	2535								10774								10973							

Standard errors are in parentheses; */**/*** denotes coefficient statistically significant at 0.9/0.09/0.99 level. All models were estimated with country-pair and time fixed effects estimator.

4.2.2 2001-2009 and 2010-2018

We then continue our analysis by dividing our sample into two time periods, around the GFC. The results of this exercise can be found in Table 4. In terms of the financial variables, the first notable difference from the main results is that the mean returns differentials are not statistically significant in the first period. The opposite is true for the correlations, which is significant in the first period, but mostly no longer significant in the second period. Differences in variances remain significant in both periods.

In terms of macroeconomic variables, the CA share is significant in the first period but not in the second half, after the GFC. Moreover, differences in GDP per capita are important in the first sub-sample but cease to be significant in the second period. Finally, the BCS is not significant in the first period but becomes significant in the second half of the period. This could be associated with the change in the significance of the correlation coefficient described above. In summary, we can see that there tends to be a mechanism that works against international risk sharing, confirming our previous results. In the case of the macroeconomic variables we identify the flow of equities between countries in the same business cycle. In the case of institutional variables, there are no notable changes between the main results and when the sample is divided into two time periods.

4.3 Semi-parametric regression

To examine, whether the results might be driven by nonlinearities we turn to the results of the semi-parametric regression depicted in Figure 3. In the case of the three financial variables, placed in panels a), b), and c), we can identify a straight line as a best nonlinear estimate. This, on the one hand, may validate the use of a linear estimator. On the other hand, we can also see that the confidence bands spread considerably as the observations move toward the lowest and highest values of the independent variables. This could mean that the shape of the line is mostly driven by medium size observations that dominate the sample. Consequently, the results show that using semi-parametric regression and a further examination of the results by quantiles may reveal some new facts about the underlying relationships between portfolio equity flows and financial variables.

The case for nonlinearities is even stronger among the macroeconomic variables. For instance, exports as a share of GDP grow almost linearly for the low values that dominate the sample,

Table 4: Results from sub-samples: 2001-2009 and 2010-2018

Period	2001-2009								2010-2018							
Variable	Model 1		Model 2		Model 3		Model 4		Model 1		Model 2		Model 3		Model 4	
Rdif	2690		2872		1599		2007		11683	**	10380	**	11440	**	9999	**
	(2694)		(2716)		(2735)		(2733)		(4979)		(4960)		(4949)		(4959)	
SDdif	5865	***	5984	***	4439	*	5406	***	13458	***	15970	***	13870	***	15730	***
	(1655)		(1751)		(1741)		(1749)		(2742)		(2848)		(2838)		(2847)	
Cor	1896	***	780	***	577	*	530	**	2244	***	387		411		239	
	(215)		(233)		(240)		(240)		(275)		(306)		(310)		(308)	
CA			-1663	***	-1437	***	-1428	***			-1099	*	-323		-959	
			(436)		(428)		(428)				(608)		(604)		(608)	
CapControls			1753	***	1311	***	1478	***			1383	***	1696	***	1124	***
			(230)		(237)		(239)				(332)		(343)		(340)	
Exchange			1941		1489		1496				5674		5869		7028	*
			(2117)		(2119)		(2117)				(3881)		(3903)		(3897)	
RepStab			159								576	***			596	***
			(120)								(135)				(135)	
ParStab			-374	***			-764	***			283	**			-149	
			(115)				(143)				(130)				(176)	
RepVoice					292	**	261	*					-251			
					(149)		(149)						(174)			
RepVoice					243	*	803,1	***					594	***	(803)	***
					(140)		(175)						(164)		(222)	
Export			31570	***	28730	***	32040	***			26830	***	26910	***	27870	***
			(6207)		(6192)		(6216)				(7223)		(7221)		(7225)	
Import			17700	***	18750	***	15020	***			26880	***	26240	***	23760	***
			(5754)		(5744)		(5780)				(6713)		(6708)		(6765)	
GDPpcdif			-0.00	***	-0.00	***	-0.00	***			-0.00		-0.00		-0.00	
			(0.00)		(0.00)		(0.00)				(0.00)		(0.00)		(0.00)	
BCS			160		188		189				485	***	493	***	498	***
			(139)		(140)		(140)				(167)		(167)		(167)	
Debtdif			-0.47		-1.99		-2.92				-20.18	***	-14.96	***	-18.34	***
			(3.87)		(3.95)		(3.95)				(4.75)		(4.79)		(4.77)	
GDPprod			0.00	***	0.00	***	0.00	***			0.00	***	0.00	***	0.00	***
			(0.00)		(0.00)		(0.00)				(0.00)		(0.00)		(0.00)	
Sample size	12141								12141							

Standard errors are in parentheses; */**/*** denotes coefficient statistically significant at 0.9/0.09/0.99 level. All models were estimated with country-pair and time fixed effects estimator.

however, decreasing returns, and eventually a fall in the relationship is visible for the high bilateral export shares. In the case of the output gap differentials, the opposite is true. Only in the case of debt, we can make a strong case for a linear estimator.

However, the most profound nonlinear effects are found in the instance of institutional variables. Capital controls is the least severe case with a visible convex shape for high values of the measure. In the case of reporting country stability and partner country voice and accountability, the results demonstrate positive associations, nevertheless, with a very high degree of irregularity. Consequently, we believe that examination of the results using quantile regression may prove to be illuminating in exploring these relationships.

4.4 Quantile regressions

Figure 3: Results of semi-parametric regression

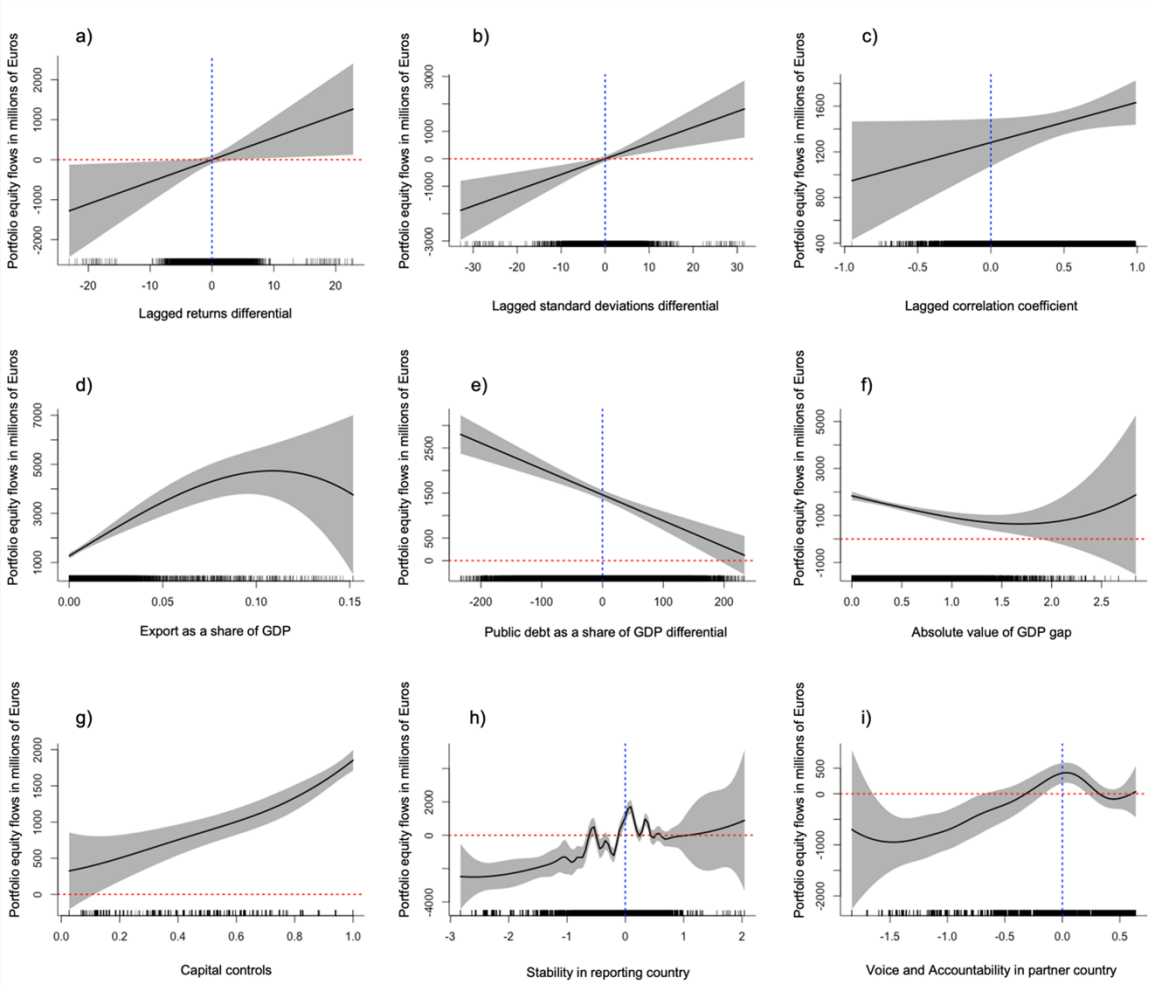


Table 5: Estimation results of the quantile regression

Variable	1^{st} quantile	2^{nd} quantile	3^{rd} quantile	4^{th} quantile	5^{th} quantile	6^{th} quantile	7^{th} quantile	8^{th} quantile	9^{th} quantile	10^{th} quantile
Rdif	1488***	352	-342	-21.2	-82.0	-105	-345	-123	1166	54613**
	(405)	(253)	(220)	(167)	(196)	(360)	(318)	(325)	(975)	(23715)
SDdif	2319***	1055***	480***	62.5	-9.4	142	384	288	1320*	12724
	(402)	(244)	(169)	(115)	(173)	(309)	(337)	(215)	(709)	(9376)
Cor	-53.0*	25.0	38.1**	54.3***	58.7**	12.9	18.5	135***	301***	-3917***
	(30.4)	(17.9)	(15.9)	(19.2)	(24.8)	(28.2)	(24.9)	(30.1)	(93.5)	(639)
CA	-353***	-163***	-45.5	10.0	-16.5	33.4	64.2	131	343***	-4504***
	(81)	(52)	(38.9)	(34.8)	(43.0)	(69.3)	(90.3)	(104)	(120)	(1719)
CapControls	454***	156***	111***	82.7***	120***	145***	120***	136***	71.1	7588***
	(56)	(25)	(24)	(21)	(21)	(35)	(30)	(33)	(76.8)	(1304)
Exchange	-268	412*	534***	362**	541	987*	820**	657**	-25.9	37715**
	(246)	(235)	(118)	(183)	(400)	(571)	(346)	(300)	(574)	(14824)
RepStab	-74.4***	-8.37	30.5***	57.3***	83.4***	108***	140***	128***	201***	1153
	(11.6)	(9.62)	(10.2)	(8.9)	(10.0)	(14.8)	(15.2)	(17.6)	(37.1)	(1012)
ParVoice	27.3	18.0**	37.1***	62.7***	101***	130***	166***	131***	158***	750
	(21.2)	(7.5)	(10.1)	(11.8)	(17.0)	(22.5)	(25.8)	(24.1)	(49.5)	(934)
Export	-12671***	-1594	3481***	7347***	11580***	18505***	25952***	39156***	78161***	-33136
	(4187)	(1274)	(1259)	(2001)	(2408)	(1812)	(2579)	(5208)	(10097)	(32536)
Import	-24712***	-5184***	-1481	2349*	5412***	12053***	19746***	42101***	122325***	-143330***
	(3538)	(1390)	(1186)	(1304)	(1670)	(1640)	(3685)	(5094)	(13885)	(24014)
GDPpcdif	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00***	-0.00***	-0.00***	-0.00**	-0.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
BCS	30.4	26.4**	70.3***	74.6***	184***	203***	166***	84.8***	97.9	-704
	(18.8)	(12.7)	(10.6)	(10.7)	(14.9)	(19.1)	(21.9)	(20.1)	(60.9)	(870)
Debtdif	-1.17	0.08	0.30	0.54	-0.001	-0.54	-0.26	-0.10	-2.52	-19.2
	(0.72)	(0.46)	(0.32)	(0.36)	(0.52)	(0.54)	(0.48)	(0.49)	(1.56)	(23.5)
GDPprod	-0.00***	-0.00**	0.00	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	-0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Sample size	2428	2428	2428	2428	2428	2428	2428	2428	2428	2428

Standard errors are in parentheses; */**/*** denotes coefficient statistically significant at 0.9/0.09/0.99 level. All models were estimated with country-pair and time fixed effects estimator.

We now report quantile regression results in Table 5. In the case of the financial variables, we see that differences in the lagged rates of returns are only important for the bottom and for the top quantiles, where the outflows are the highest and the inflows are the highest, respectively. There is no statistical significance for the quantiles in-between. For the lagged differences in standard deviations, we have statistically significant results in the bottom three quantiles, where all the data refers to capital outflows, and additionally at the ninth quantile, but only at the lowest conventional confidence level.

Nevertheless, the most interesting results are for the lagged correlations. The coefficient is positive and significant in the third, fourth, fifth, eight, and ninth quantile, and from the second to the ninth quantile the coefficients are positive. This group is likely to be driving the sign of the coefficients in the main results. However, the situation is different in the bottom and top quantile – the coefficient is negative and significant, providing evidence for risk-sharing behavior that could not be seen in the main results. What we can observe in these quantile results is that fundamental financial forces are not particularly important for the medium size flows, however, they are crucial for the determination of the highest size of outflows and inflows.

A similar picture can be seen in the case of the current account as a share of GDP. The coefficients are only significant at the two bottom and two top quantiles. This points to the possibility that the CA is a relevant determinant for very big and very low capital flows.

Moreover, international business cycle theory predicts the existence of capital flows between the countries in different phases of the business cycle. Again, we do not find this to be true in the middle quantiles, where there are capital flows between the countries in the same phase of the business cycle. However, at the bottom quantile, and at the top two quantiles the results are no longer statistically significant. Another interesting result is uncovered in the case of bilateral imports as a share of GDP. In the top and in the bottom two quantiles the higher the imports, the higher the purchases of the portfolio equity – in line with the predictions of macroeconomic fundamentals. However, the results for quantiles from fourth to ninth are positive, which may indicate the role of financial ties through trade.

Overall, we can see that the macroeconomic variables again tend to be important for the big inflows and outflows but not for what happens in the middle. Bilateral exchange rate is important in most

of the quantiles, and always with a positive sign. This implies risk loving behavior, but not at the lowest two quantiles. We also find interesting results for the differences in real GDP per capita. The flows from the richer to poorer countries, found in the main results, are only occurring in the case of bigger inflows – the results are not significant for the outflows and small inflows – and the results become statistically significant only for the top 5 quantiles. This not only indicates that portfolio equity flows travel from the rich to poor countries, but even more importantly that they stay there. Finally, GDP product is significant and negative in the bottom two quantiles, and in the top one. Everywhere else it is positive, and significant, except for quantile three. This indicates that in the case of very big capital flows the size of the trading economies does not matter.

When it comes to institutional variables, we see that capital controls are always important (except for quantile nine), and always have a positive sign, as expected. The other two institutional variables are important only in the middle – where they are significant and with a positive sign. The only exception is a significant and negative coefficient on the reporter country stability, which should be treated as an anomaly. In summary, we have evidence that financial and overall macroeconomic variables are important determinants for big cross-country capital flows, while institutional variables are important determining factors for small capital flows.

5 Conclusions

In this paper we examine the data on bilateral inflows of portfolio equity between 40 developed economies over the period between 2001 and 2018. When we look at the entire sample some of the results seem to contradict the conventional wisdom present in international macroeconomics and finance. On the one hand, we observe inflows into countries with relatively higher returns, as predicted by the classical Markovitz model. On the other hand, we see, somewhat against the predictions of the model that capital flows to countries with relatively more volatile returns. This result is at odds with the general notion of risk averse economic agents and rather testifies to the risk seeking behavior of the agents. This outcome is not new to the literature (Crum et al., 1981), especially in the context of equity markets (Post and Levy, 2005).

The last prediction of the Markovitz model, that economic agents will try to maintain assets characterized by low correlations in their portfolios, is irreconcilable with our results. We report a

positive role of the correlation on portfolio equity flows. On the one hand, this finding stands in contrast to the international business cycle literature (Backus et al., 1992; Backus and Smith, 1993), which underlines the role of risk-sharing by agents who diversify their portfolios internationally in order to achieve greater stability in their consumption path. On the other hand, this result provides the empirical grounds for the lack of consumption risk-sharing observed in macroeconomic data in the vast body of research (Cochrane, 1991; Mace, 1991; Townsend, 1994; Lewis, 1996; Kalemli-Ozcan et al., 2001, 2003; Afonso and Furceri, 2008; Leibrecht and Scharler, 2008; Fratzscher and Imbs, 2009; Kose et al., 2009; Pierucci and Ventura, 2010; Qiao, 2010; Lewis and Liu, 2015; Rangvid et al., 2016; Fuleky et al., 2018; Parsley and Popper, 2018; Dufrénot et al., 2020).

Another result that is different to the predictions of international business cycle theory is the presence of intensified flows between countries within the same phase of the business cycle. Regardless of whether we approach this issue from the point of view of capital moving from places with depressed returns to economies with higher yield, or from the perspective of *ex post* risk-sharing, for agents selling equity in the depressed countries and purchasing in countries experiencing an economic expansion, the movement of the capital should be observed between countries in different phases of the business cycle. However, the data shows otherwise, yet reinforcing the arguments against the presence of international consumption risk-sharing.

Turning to other macroeconomic factors, the influence of the position of the current account is in line with the economic theory, as countries with current account deficits attract higher capital flows. Similarly, close bilateral trade ties, whether proxied by exports or imports, contribute positively to the magnitude of portfolio equity inflows. On the contrary, the exchange rate variability does not have impact on the portfolio equity flows. We also report the significant influence of the differences in the level of economic development on the size of capital flows. Interestingly, in contrast to the Lucas (1990) paradox, we find that the movement of capital goes from the richer to poorer countries.

Higher relative sovereign indebtedness of a country deters equity flows along the lines of standard economic theory predictions. Nevertheless, this result is strongly conditioned upon the sovereign rating of the examined countries. The inflow of equity into the countries with the AAA rating is not affected by the difference in government debt ratios, as those countries are expected to make dues on their obligations regardless of the size of their debt. However, the countries with lower sovereign

ratings must take into consideration their indebtedness when they want to attract additional capital as the risk of insolvency discourages potential investors.

Institutional factors also play an important role in driving portfolio equity flows. Capital controls still constitute one of the main forces behind the equity flows, but not in the countries with a AAA sovereign rating. This result is not surprising as the degree of capital mobility between those countries is very high with virtually no capital controls. A similar case can be made for the degree of political stability in the reporting country, and the availability of reliable information in the partner country, that is essential in countries with a below AAA rating.

The nonlinearities we observed motivated us to examine the data within 10 quantiles. The summary of the results is depicted in table 6. This exercise has proven to be extremely instructive as many of the conclusions reached based on the full sample can be put into context. Moreover, as this is the first research that investigates the importance of determinants of capital flows conditioned on the magnitude of the flows, we are able to place more appropriate economic interpretations on the phenomena described in the preceding paragraphs. The main conclusions that can be taken from the results in quantiles is the difference between what drives the flows on the tails and what determines them in the middle of the distribution.

We report that the differences in the mean of returns and differences in their standard deviations are only important on the tails, while their role is insignificant in the middle of the sample. This outcome is most visible in the case of relative returns, which influence the flows only in the cases of the highest outflows and inflows. In, the case of portfolio equity flows we still observe the risk seeking behavior of agents allocating resources in the countries with higher relative variances of the returns.

Table 6: Summary of the results per quantile

Variable type			Financial			Institutional			Macroeconomic							
Quantile	From (mln)	To (mln)	Rdif	SDdif	Cor	CapControls	RepStab	ParVoice	CA	BCS	Debtdif	GDPpcdif	Exchange	Export	Import	GDPprod
1st	-100738,600	-428,284	+	+	-	+	-		-					-	-	-
2nd	-428,284	-44,161		+		+		+	-	+			+		-	-
3rd	-44,161	-3,782		+	+	+	+	+		+			+	+		
4th	-3,782	0,003			+	+	+	+		+			+	+	+	+
5th	0,003	1,384			+	+	+	+		+				+	+	+
6th	1,384	16,752				+	+	+		+		-	+	+	+	+
7th	16,752	94,290				+	+	+		+		-	+	+	+	+
8th	94,290	446,400			+	+	+	+		+		-	+	+	+	+
9th	446,400	2421,793		+	+		+	+	+			-		+	+	+
10th	2421,793	169495,205	+		-	+			-			-	+		-	-
Total	-100738,600	169495,205	+	+	+	+	+	+		+	+	-		+	+	+

+ denotes positive and statistically significant coefficient, - denotes negative and statistically significant coefficient,, while blank spaces represent coefficients not significant at any conventional level.

The results from the quantile regression shed a very different light on the conclusions concerning the direction capital flows and risk-sharing from the international business cycle models. Correlations of the returns has a positive or no impact on the flows in the eight middle quantiles. However, in the very bottom and top quantiles the coefficient turns negative indicating the risk-sharing in line with predictions of the standard models (Obstfeld and Rogoff, 1996). The capital flows between countries in the same phase of the business cycle are significantly higher for countries in the middle quantiles, while it is not the case in the bottom and in the two top quantiles. Accordingly, the predictions of international business cycle models work very well in the tails, *ergo* in the cases of outflows and inflows of the highest magnitude (approximately above 400 million Euros in absolute value). A similar statement can be made for the current account position that has a negative and significant impact on the portfolio equity flows in the two bottom and in the top quantile. Those results taken together show that the inflows and outflows of the highest magnitude are in fact influenced by major financial and macroeconomic forces along the lines of the prediction of the standard models, notwithstanding the risk seeking behavior of the economic agents.

The results also show that the factors that are driving the medium size flows are associated with institutions and bilateral relations between countries. For the medium quantiles, bilateral trade relations, proxied by imports and exports, positively influence the portfolio capital flows. The same can be inferred for exchange rate volatility, however, here we again find the risk seeking behavior of the economic agents. The absence of capital controls, political stability in the reporting country, and availability of information in the partner country all have a positive impact on portfolio equity flows. Consequently, the role of the institutional factors and bilateral relations is crucial in determining international portfolio equity flows.

Finally, we can make a very interesting observation about the role of differences in the degree of economic development between the examined economies. In contrast with the Lucas paradox we see that capital flows from richer to poorer countries, however, this result is significant only in the top five quantiles. In other words, the difference in the development between the economies matters only for inflows and not for outflows. Consequently, the portfolio capital flows from the richer countries, and once it is in the poorer countries, other factors determine the decision about its withdrawal.

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Appendix A: Missing country pairs

Reporter	Partner	Reporter	Partner	Reporter	Partner	Reporter	Partner	Reporter	Partner
Australia	Estonia	Hong Kong	Hungary	Netherlands	Slovakia	Malta	Hungary	Turkey	Lithuania
Australia	Hungary	Hong Kong	Latvia	New Zealand	Norway	Mauritius	Hungary	Mexico	Malta
Australia	Latvia	Hong Kong	Norway	New Zealand	Panama	Mexico	Hungary	New Zealand	Malta
Australia	Lebanon	Hong Kong	Slovakia	New Zealand	Poland	Netherlands	Hungary	Romania	Malta
Australia	Norway	Hungary	Lebanon	New Zealand	Romania	New Zealand	Hungary	Singapore	Malta
Australia	Slovakia	Hungary	Norway	New Zealand	Slovakia	Norway	Hungary	Turkey	Malta
Austria	Hungary	Hungary	Slovakia	New Zealand	Turkey	Panama	Hungary	Mexico	Mauritius
Austria	Norway	Iceland	Latvia	Norway	Slovakia	Poland	Hungary	New Zealand	Mauritius
Austria	Slovakia	Iceland	Lebanon	Panama	Romania	Portugal	Hungary	Panama	Mauritius
Belgium	Hungary	Iceland	Malta	Panama	Slovakia	Romania	Hungary	Poland	Mauritius
Belgium	Norway	Iceland	Mauritius	Poland	Slovakia	Singapore	Hungary	Portugal	Mauritius
Belgium	Slovakia	Iceland	Norway	Portugal	Slovakia	Slovakia	Hungary	Romania	Mauritius
Canada	Hungary	Iceland	Romania	Romania	Slovakia	Spain	Hungary	Slovakia	Mauritius
Canada	Norway	Iceland	Slovakia	Singapore	Slovakia	Sweden	Hungary	Spain	Mauritius
Canada	Slovakia	Ireland	Norway	Malta	Chile	Switzerland	Hungary	Turkey	Mauritius
Chile	Hungary	Ireland	Slovakia	New Zealand	Chile	Turkey	Hungary	New Zealand	Mexico
Chile	Lebanon	Italy	Norway	Romania	Chile	UK	Hungary	Poland	New Zealand
Chile	Norway	Italy	Slovakia	Singapore	Chile	USA	Hungary	Romania	New Zealand
Chile	Slovakia	Japan	Norway	Mauritius	Czechia	New Zealand	Iceland	Panama	Norway
Czechia	Hungary	Japan	Slovakia	Mexico	Czechia	Singapore	Iceland	Poland	Norway
Czechia	Norway	Korea	Norway	New Zealand	Czechia	Turkey	Iceland	Portugal	Norway
Czechia	Slovakia	Korea	Slovakia	Panama	Czechia	Lebanon	Latvia	Romania	Norway
Estonia	Hungary	Latvia	Lebanon	Turkey	Czechia	Malta	Latvia	Singapore	Norway
Estonia	Lebanon	Latvia	Norway	Greece	Estonia	Mauritius	Latvia	Slovakia	Norway
Estonia	Norway	Latvia	Slovakia	Hong Kong	Estonia	Mexico	Latvia	Spain	Norway
Estonia	Slovakia	Lebanon	Norway	Lebanon	Estonia	New Zealand	Latvia	Sweden	Norway
Finland	Hungary	Lebanon	Slovakia	Mauritius	Estonia	Panama	Latvia	Switzerland	Norway
Finland	Lebanon	Lithuania	Norway	Mexico	Estonia	Romania	Latvia	Turkey	Norway
Finland	Norway	Lithuania	Slovakia	New Zealand	Estonia	Singapore	Latvia	UK	Norway
Finland	Slovakia	Luxembourg	Norway	Panama	Estonia	Turkey	Latvia	USA	Norway
France	Hungary	Luxembourg	Slovakia	Singapore	Estonia	Lithuania	Lebanon	Romania	Panama
France	Norway	Malta	New Zealand	Turkey	Estonia	Malta	Lebanon	Turkey	Panama
France	Slovakia	Malta	Norway	Malta	Hong Kong	Mexico	Lebanon	Singapore	Romania
Germany	Hungary	Malta	Panama	Romania	Hong Kong	New Zealand	Lebanon	Spain	Slovakia
Germany	Norway	Malta	Slovakia	Iceland	Hungary	Panama	Lebanon	Sweden	Slovakia
Germany	Slovakia	Mauritius	Norway	Ireland	Hungary	Poland	Lebanon	Switzerland	Slovakia
Greece	Hungary	Mauritius	Slovakia	Italy	Hungary	Portugal	Lebanon	Turkey	Slovakia
Greece	Lebanon	Mexico	New Zealand	Japan	Hungary	Romania	Lebanon	UK	Slovakia
Greece	Malta	Mexico	Norway	Korea	Hungary	Singapore	Lebanon	USA	Slovakia
Greece	Mauritius	Mexico	Poland	Latvia	Hungary	Slovakia	Lebanon		
Greece	Norway	Mexico	Romania	Lebanon	Hungary	Mauritius	Lithuania		
Greece	Panama	Mexico	Slovakia	Lithuania	Hungary	Mexico	Lithuania		
Greece	Slovakia	Netherlands	Norway	Luxembourg	Hungary	New Zealand	Lithuania		

Appendix B: List of countries and stock indices

Country	Index	Country	Index	Country	Index	Country	Index	Country	Index
Australia	AS51	France	CAC	Japan	NKY	Mexico	MEXBOL	Singapore	STI
Austria	ATX	Germany	DAX	Korea	KOSPI	Netherlands	AEX	Slovakia	SKSM
Belgium	BEL20	Greece	ASE	Latvia	RIGSE	New Zealand	NZSE	Spain	IBEX
Canada	SPTSX	Hong Kong	HSI	Lebanon	BLOM	Norway	OBX	Sweden	OMX
Chile	IGPA	Hungary	BUX	Lithuania	VILSE	Panama	BVPS	Switzerland	SMI
Czechia	PX	Iceland	ICEXI	Luxembourg	LUXXX	Poland	WIG	Turkey	XU100
Estonia	TALSE	Ireland	ISEQ	Malta	MALTEX	Portugal	PSI20	UK	UKX
Finland	HEX25	Italy	FTSEMIB	Mauritius	SEMDEX	Romania	BET	USA	SPX

Appendix C: Main results with stock market indices expressed in local currency

Variable	Model 1		Model 2		Model 3		Model 4	
Rdif	5620	**	6357	**	4034	**	4857	*
	(2707)		(2694)		(2711)		(2703)	
SDdif	6521	***	7403	***	5108	***	6160	***
	(1633)		(1707)		(1705)		(1707)	
Cor	1770	***	399	**	316	*	302	*
	(164)		(176)		(178)		(177)	
CA			-1285	***	-770	**	-1129	***
			(367)		(363)		(368)	
CapControls			1589	***	1523	***	1248	***
			(196)		(202)		(199)	
Exchange			3096		3198		3160	
			(1978)		(1978)		(1977)	
RepStab			369	***			393	***
			(90)				(90)	
ParStab			30.3					
			(86.5)					
RepVoice					-8.8			
					(113)			
ParVoice					484	***	513	***
					(106)		(106)	
Export			29330	***	28680	***	29060	***
			(4779)		(4776)		(4763)	
Import			23780	***	23240	***	22010	***
			(4439)		(4440)		(4447)	
GDPpcdif			-0.00	***	-0.00	***	-0.00	***
			(0.00)		(0.00)		(0.00)	
BCS			342	***	349	***	354	***
			(109)		(109)		(109)	
Debtdif			-9.53	***	-9.13	***	-9.40	***
			(2.99)		(2.99)		(2.99)	
GDPprod			0.00	***	0.00	***	0.00	***
			(0.00)		(0.00)		(0.00)	
Sample size	24282							

Standard errors are in parentheses; */**/*** denotes coefficient statistically significant at 0.9/0.09/0.99 level. All models were estimated with country-pair and time fixed effects estimator.

Appendix D: Results from sub-samples: 2001-2009 and 2010-2018 with stock market indices expressed in local currency

	2001-2009								2010-2018							
Variable	Model 1		Model 2		Model 3		Model 4		Model 1		Model 2		Model 3		Model 4	
Rdif	468		1134		-945		-214		17905	***	16330	**	16290	***	15740	***
	(2876)		(2936)		(2975)		(2975)		(5487)		(5448)		(5447)		(5448)	
SDdif	5780	***	5749	***	4015	**	4838	***	6299	*	10190	***	6799	*	9514	***
	(1746)		(1842)		(1847)		(1852)		(3258)		(3478)		(3469)		(3481)	
Cor	1972	***	908	***	761	***	734	***	1573	***	-18		-102		-119	
	(209)		(226)		(230)		(230)		(250)		(270)		(271)		(271)	
CA			-1748	***	-1533	***	-1525	***			-812		-25		-664	
			(437)		(430)		(430)				(610)		(605)		(611)	
CapControls			1736	***	1288	***	1452	***			1500	***	1823	***	1223	***
			(230)		(237)		(239)				(329)		(341)		(338)	
Exchange			2020		1547		1554				6105		6454	*	7470	*
			(2116)		(2119)		(2117)				(3885)		(3905)		(3900)	
RepStab			151				-747	***			565	***			577	***
			(120)				(143)				(135)				(135)	
ParStab			-360	***							323	**			-118	
			(115)								(130)				(177)	
RepVoice					270	*	239	**					-247			
					(149)		(149)						(173)			
ParVoice					258	*	800	***					656	***	817	***
					(141)		(175)						(163)		(222)	
Export			31040	***	28120	***	31330	***			28120	***	28640	***	29030	***
			(6205)		(6190)		(6214)				(7217)		(7219)		(7218)	
Import			17520	***	18290	***	14610	**			28290	***	27540	***	25010	***
			(5754)		(5745)		(5782)				(6722)		(6720)		(6777)	
GDPpcdif			-0.00	***	-0.00	***	-0.00	***			-0.00		-0.00	*	-0.00	
			(0.00)		(0.00)		(0.00)				(0.00)		(0.00)		(0.00)	
BCS			159		184		183				492	***	504	***	502	***
			(140)		(140)		(140)				(167)		(167)		(167)	
Debtdif			-0.44		-1.86		-2.72				-18.39	***	-12.47	**	-16.30	***
			(3.88)		(3.95)		(3.95)				(4.92)		(4.97)		(4.95)	
GDPprod			0.00	***	0.00	***	0.00	***			0.00	***	0.00	***	0.00	***
			(0.00)		(0.00)		(0.00)				(0.00)		(0.00)		(0.00)	
Sample size	12141								12141							

Standard errors are in parentheses; */**/*** denotes coefficient statistically significant at 0.9/0.09/0.99 level. All models were estimated with country-pair and time fixed effects estimator.

Appendix E: Results from sub-samples: sovereign ratings with stock market indices expressed in local currency

	Flows between AAA rating countries				Flows between below AAA rating				Flows between AAA and below AAA rating			
Variable	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Rdif	11644	15460	15460	15510	7379**	7598**	6133	8165***	3465	2936	192	883
	(16847)	(16660)	(15460)	(16660)	(3749)	(3726)	(3749)	(3713)	(3809)	(3811)	(3842)	(3825)
SDdif	20719**	19020**	19020**	19120**	2654	3811	2107	4519*	10279***	9471***	7117***	7998***
	(9937)	(9937)	(9924)	(9915)	(2249)	(2361)	(2366)	(2328)	(2320)	(2441)	(2435)	(2440)
Cor	5895***	2365**	2365**	2364**	1731***	576**	485*	573**	1190***	113	-2	-15
	(928)	(1094)	(1094)	(1094)	(245)	(256)	(257)	(256)	(231)	(247)	(249)	(248)
CA		-1812	-1812	-1791		1160*	1837***	1114*		-1956***	-1482***	-1721***
		(1169)	(1154)	(1159)		(672)	(669)	(671)		(477)	(471)	(478)
CapControls		2489**	2489	2570*		1575***	1851***	1719***		1603***	1417***	1213***
		(1197)	(2489)	(1061)		(278)	(291)	(266)		(272)	(277)	(275)
Exchange		17080	17080	17120		2195	1994	2108		2795	2865	2637
		(10550)	(10550)	(10550)		(2771)	(2775)	(2771)		(2798)	(2794)	(2794)
RepStab		83				576***		567***		263**		314***
		(566)				(127)		(127)		(129)		(128)
ParStab		-2144***		-2138***		221*				167		
		(492)		(490)		(124)				(125)		
RepVoice			380				-53				21	
			(450)				(183)				(151)	
ParVoice			493				319*				670***	710***
			-419				-169				-142	-142
Export		78150***	78150***	77860***		19150**	19620**	20320**		13530**	13580**	13730**
		(12150)	(78150)	(11990)		(10180)	(10190)	(10160)		(6147)	(6141)	(6124)
Import		21190*	21190***	21310*		48850***	50640***	48710***		11660**	9751*	9059
		(11550)	(11550)	(11530)		(9307)	(9315)	(9308)		(5701)	(5701)	(5705)
GDPpcdif		-0.00	-0.00	-0.00		-0.00	-0.00*	-0.00		-0.00***	-0.00***	-0.00***
		(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)
BCS		84.9	84.9	87.2		625***	633***	628***		104	120	133
		(423)	(423)	(423)		(162)	(162)	(162)		(151)	(151)	(151)
Debtdif		0.13	0.13	0.58		-14.62***	-13.55***	-15.06***		-8.58*	-10.04**	-9.74**
		(15.49)	(15.34)	(15.18)		(4.15)	(4.17)	(4.14)		(4.42)	(4.43)	(4.42)
GDPprod		0.00***	0.00***	0.00		0.00***	0.00***	0.00		0.00***	0.00***	0.00***
		(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)
Sample size	2535				10774				10973			

Standard errors are in parentheses; */**/*** denotes coefficient statistically significant at 0.9/0.09/0.99 level. All models were estimated with country-pair and time fixed effects estimator.

Appendix F: Results from sub-samples: investment grade

Subsample	Flows between Investment grade countries								Flows between below Investment grade								Flows between Investment and below Investment grade					
Variable	Model 1		Model 2		Model 3		Model 4		Model 1		Model 2		Model 3		Model 4		Model 1		Model 2		Model 3	
Rdif	9095	**	9825	***	8037	**	8472	***	12399		-1723		1164		1837		2706		1902		1294	
	(3253)		(3226)		(3236)		(3230)		(17825)		(17500)		(17450)		(17460)		(3685)		(3655)		(3664)	
Sddif	14219	***	15110	***	13630	***	14230	***	-5716		12640		8578		4382		3793	**	4080	**	2613	
	(2176)		(2202)		(2197)		(2201)		(8994)		(10840)		(11310)		(9983)		(1832)		(2053)		(2049)	
Cor	2119	***	437	*	238		255		5266	***	1046		1853		1193		1630	***	980	***	1211	***
	(219)		(242)		(247)		(244)		(1636)		(1895)		(1864)		(1804)		(287)		(301)		(303)	
CA			-1487	***	-1175	***	-1282	***			9801		18930	***	17100	***			300		1489	**
			(424)		(424)		(425)				(7041)		(6821)		(5395)				(753)		(743)	
CapControls			1430	***	1158	***	973	***			4668	***	5586	***	4751	***			1683	***	2252	***
			(249)		(254)		(251)				(1716)		(1740)		(1652)				(314)		(320)	
Exchange			4664	*	4707	*	4514	*			-4144		-5877		-3404				367		-569	
			(2544)		(2542)		(2542)				(14990)		(15070)		(15000)				(2911)		(2917)	
RepStab			473	***			465	***			1354								445	***		
			(141)				(141)				(878)								(134)			
ParStab			-121								-1142								387	***		
			(129)								(778)								(129)			
RepVoice					87								-526								-276	
					(156)								(1417)								(185)	
RepVoice					680	***	674	***					-1675								157	
					(141)		(141)						(1235)								(171)	
Export			32930	***	31760	***	32540	***			77960		78830		84050				-50260	**	-47250	**
			(5106)		(5095)		(5084)				(113900)		(114500)		(114100)				(21450)		(21570)	
Import			22070	***	22040	***	21100	***			65290		54550		68930				66690	***	63490	***
			(4781)		(4765)		(4768)				(102600)		(102200)		(1013000				(16100)		(16230)	
GDPpcdif			-0.00		-0.00	*	-0.00				-0.00	**	-0.00	***	-0.00	***			-0.00		-0.00	
			(0.00)		(0.00)		(0.00)				(0.00)		(0.00)		(0.00)				(0.00)		(0.00)	
BCS			258	**	278	*	285	**			1426		1328		1292				497	***	467	**
			(130)		(130)		(130)				(1022)		(1024)		(1023)				(191)		(191)	
Debtdif			-5.09		-4.70		-5.11				-109	***	-93	***	-74	***			-12,95	***	-12,57	***
			(3.95)		(3.94)		(3.94)				(28)		(34)		(22)				(4,28)		(4,28)	
GDPprod			0.00	***	0.00	***	0.00	***			0.00		0.00		0.00				0.00		0.00	
			(0.00)		(0.00)		(0.00)				(0.00)		(0.00)		(0.00)				(0.00)		(0.00)	
Sample size	18530								5415								337					

Standard errors are in parentheses; */**/*** denotes coefficient statistically significant at 0.9/0.09/0.99 level. All models were estimated with country-pair and time fixed effects estimator.