Can Macroprudential Measures Make Cross-Border Lending More Resilient? Lessons from the Taper Tantrum*

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We study the extent to which macroprudential regulatory measures were successful in alleviating the negative shock that the taper tantrum of 2013 imposed on bilateral cross-border lending flows. We use a novel data set combining the BIS stage 1 enhanced banking statistics on bilateral cross-border lending flows with the IBRN's macroprudential database. Our results suggest that macroprudential measures implemented in borrowers' host countries prior to the taper tantrum significantly reduced the negative effect of the tantrum on cross-border lending growth. The shock-mitigating effects of host-country macroprudential rules are present both in lending to banks and in lending to non-banks, and are stronger for lending flows to borrowers in advanced economies and to the non-bank sector in general. Source (lending) banking system measures do not affect bilateral lending flows, nor do they enhance the effect of host-country macroprudential measures. Our results imply that policymakers may consider applying macroprudential tools to mitigate international shock transmission through cross-border bank lending.

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1. Introduction

Since the financial crisis, many jurisdictions have used macroprudential policies, applying prudential tools in order to limit systemic risk (IMF–FSB–BIS 2016). Yet, evidence on the effectiveness of such tools remains scarce—in part due to the relative absence of recent episodes of financial disruptions which would allow for an assessment of what remains a fairly new set of tools. A notable exception is the so-called taper tantrum—a large U.S. dollar funding shock in international financial markets, which developed after Federal Reserve Board Chairman Ben Bernanke's indication in mid-2013 that the Fed would start tapering off its quantitative easing program—which caused a broad-based but heterogeneous reduction in cross-border financial flows (Avdjiev and Takáts 2014). As such, this episode is an ideal testing ground for assessing the role of macroprudential tools in lending stabilization.

The taper tantrum has raised a series of questions for policymakers and researchers alike: Did cross-border bank lending remain more stable in those borrowers' host countries which had more actively applied macroprudential tools beforehand? Was lending more resilient from those source (lending) banking systems which had applied more macroprudential tools? Were source or host measures more effective? Were advanced and emerging markets affected differently? Which macroprudential tools affected cross-border bank lending more? Did regulations stabilize lending to banks and nonbank borrowers alike? Did source lending system and host-country measures interact?

In this paper, we answer these questions by using a novel data set. We combine the "stage 1 enhancements" to the Bank for International Settlements' (BIS) international banking statistics with the International Banking Research Network's (IBRN) prudential regulatory database. Because we are interested in the workings of macroprudential tools, we focus on macroprudential elements in the IBRN database (and not on (micro)prudential measures such as capital requirements).

In terms of methodology, we employ a difference-in-difference analysis to compare the growth rate of bilateral cross-border bank lending right before and immediately after the taper tantrum shock. More precisely, we assess whether the slowdown in lending growth

during the taper tantrum was mitigated by the cumulative macroprudential measures undertaken in the period leading up to the tantrum (that is, from the beginning of our sample in 2000:Q1 until 2013:Q1—the quarter just prior to the beginning of the taper tantrum).

We find broad evidence that macroprudential measures applied beforehand stabilized cross-border lending flows during the taper tantrum. Most importantly, macroprudential tools applied in borrowers' host countries stabilized the growth of cross-border bank lending inflows significantly. The impact is stronger for lending to borrowers in advanced economies than for lending to borrowers in emerging markets. The impact is generally present for lending to both bank and non-bank borrowers, but the results on lending to non-bank borrowers are more broadly robust. We do not find evidence that macroprudential policies applied in source (lending) banking systems affected the growth of cross-border bank lending outflows during the tantrum, or that source (lending banking system) and host-country macroprudential measures would have significantly interacted with each other in affecting cross-border lending flows.

The lending-stabilizing impact of macroprudential tools was not only statistically but also economically significant. In the overall sample, an additional macroprudential tightening action over the 2000:Q1–2013:Q1 period attenuated the tantrum effect on cross-border bank lending by around 1 percentage point. This translates to a differential tantrum impact on cross-border flows of around 8 percentage points, when we compare host countries at the 90th versus the 10th percentile of macroprudential regulatory stringency. For advanced economies, the respective figures are around 2.5 percentage points and 13 percentage points. Our findings are robust to the addition of a range of macroeconomic controls, and to variations in the construction of macroprudential indexes and lending flows. The results are also present in most subsets of macroprudential tools, though, as expected, are not significant for all components.

The results are relevant for policymakers: They suggest that macroprudential tools not only contribute to the stability of the domestic financial system but also enhance cross-border bank financing inflows to an economy. Our result confirming the strong and

significant effects of macroprudential tools applied in host countries suggests that, though international coordination can play a useful rule, it remains paramount that countries "keep their house in order." The significant shock-alleviating role of macroprudential rules in lending to the non-bank sector of emerging markets may be of particular policy relevance. Importantly, while we do not find significant evidence that the stabilizing potential depends on the interaction between source and host macroprudential measures, this does not necessarily imply that externalities do not exist. For instance, more-stable host-country financial systems might make the source (lending) banking systems also more resilient, by providing stable bank financing demand.

The paper proceeds as follows. In section 2 we link our work to the growing volume of related literature. In section 3 we describe our data in detail, and we present the econometric methodology in section 4. We detail the results in section 5, and discuss the robustness of our findings in section 6. In section 7, we discuss the main caveats, and we conclude with policy implications in section 8.

2. Related Literature

Our work is at the intersection of macroprudential policies and spillovers in international financial stability and regulation. The research on macroprudential policies dates back to Crockett (2000) and Borio (2003) and is reviewed in detail by Galati and Moessner (2011), among others. The policy discussion, as recently shown, for instance, in IMF–FSB–BIS (2016), suggests that macroprudential policies have an international dimension.

In particular, several research pieces point in the direction that macroprudential policies could spill over across borders through the activities of internationally active banks. However, our paper is the first to look at the stabilizing role of macroprudential policies during financial stress. This focus sets our paper aside from most papers in the literature which look at how macroprudential or regulatory policies might affect lending under normal financial conditions. In this line of work, Houston, Lin, and Ma (2012), for instance, find that regulations can affect international banks' activities by transferring funds to less-regulated markets. Ongena, Popov, and

Udell (2013) find evidence for risk shifting when lending standards differ across jurisdictions.[1] Berrospide et al. (2017) and Temesvary (2018) find regulatory spillovers into bilateral bank flows to and from the United States. In addition, Ocampo (2011) studies countercyclical regulations in developing countries, and Laeven, Ratnovski, and Tong (2014) examine the importance of bank rules which address systemic risk. One particular channel of regulatory spillovers, as Karolyi, Sedunov, and Taboada (2017) show, could work through financial stability. The presence of this latter channel raises the possibility that macroprudential policies, which aim to strengthen financial stability, might also spill over to other countries via international bank lending. Buch and Goldberg (2016) summarize related cross-country evidence in the framework of the IBRN network.

The channels of macroprudential spillovers seem in many aspects analogous to how monetary policy spillovers occur. One channel is cross-border bank lending (Cetorelli and Goldberg 2012; Forbes and Warnock 2012; Miranda-Agrippino and Rey 2015); another is the currency denomination of cross-border bank loans (Ongena, Schindele, and Vonnak 2014; Alper et al. 2016; Avdjiev, Subelyte, and Takáts 2016; Avdjiev and Takáts 2016; Takáts and Temesvary 2017).

In terms of data use, Avdjiev et al. (2017), part of the IBRN research effort discussed in Buch and Goldberg (2016), is the closest to our work, as they also combine BIS data (though not the stage 1 enhancements) and the IBRN prudential database. However, their focus is very different from ours. They investigate the continuous impact of prudential tools on cross-border bank lending over time (i.e., whether prudential tools enacted in one quarter affect cross-border bank lending in the following quarter, on average). They do not focus on, as we do, whether the accumulation of prudential regulation increases resilience of cross-border bank lending during

[1] Somewhat similarly, Aiyar et al. (2014) or Forbes, Reinhardt, and Wieladek (2017) argue that stronger capital regulations might reduce cross-border lending supply. However, this research differs from ours in that we explicitly exclude prudential regulation from our database (with the exception of robustness checks), as we explain in detail later.

financial stress—and how rules adopted in one country affect cross-border bank lending and potential spillovers in this regard.

In terms of theoretical work, Agenor et al. (2017) provide a model for how macroprudential policies might spill over internationally. However, this theoretical model focuses on spillovers into financial flows during normal times, while we focus on the stability of financial flows during a period of financial stress.

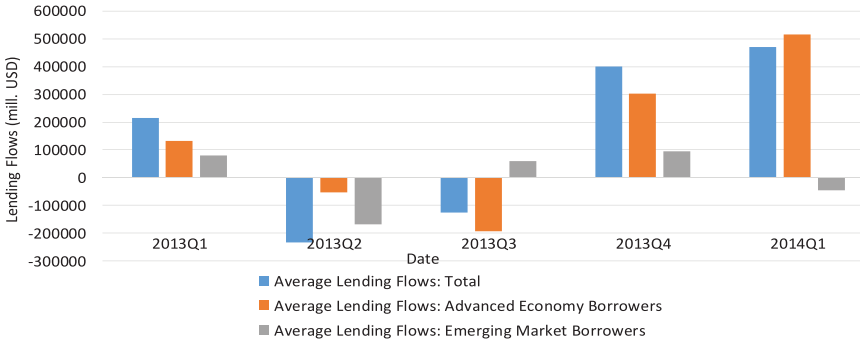
Finally, our work also builds on research which argues that national borders and economically relevant decisionmaking units often diverge, as we also describe in Takáts and Temesvary (2017). The discussion dates back to Cecchetti, Fender, and McGuire (2010) and Fender and McGuire (2010), who show that the lending bank's nationality tends to be more relevant than its residence in identifying the decisionmaking unit. This argument is further developed from a policy perspective in Committee on the Global Financial System (2011). Building on these findings, Avdjiev, McCauley, and Shin (2015) coin the term of the (absence of) triple coincidence in international finance. This term refers to the phenomenon that national borders, the conventional units of international economic analysis, often do not coincide with the economically relevant decisionmaking unit. Following these lessons, we focus on "lending banking systems" as opposed to "lending countries," so that we can follow the decisionmaking unit as precisely as possible.

3. Data Description

3.1 Data on Bilateral Cross-Border Lending Flows

We collect data on bilateral cross-border bank lending flows from the stage 1 enhancements to the Bank for International Settlement's international banking statistics (BIS IBS) which is detailed, for instance, in Avdjiev, McGuire, and Wooldridge (2015). The data cover around 30 trillion U.S. dollars in total cross-border claims. The main advantage of using the stage 1 enhancements is that this data set allows us to link lending banking systems with the host countries of borrowers, while retaining information on the currency composition of the lending flows (table 9 in the appendix). Importantly, this data set uniquely allows us to correctly measure the change in bank

Figure 1. Changes in Lending Flows: 2013–14



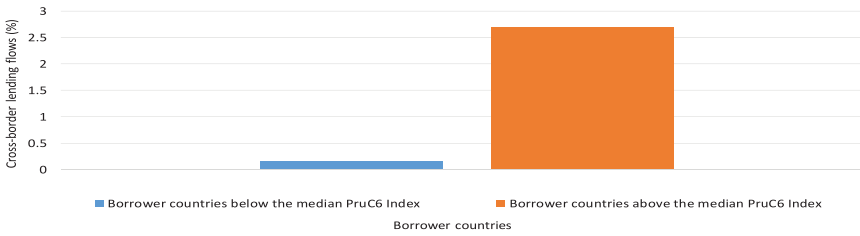
Source: BIS banking statistics.
Note: See online file at http://www.ijcb.org for color version of this figure.

claims between lending banking systems and host countries, without the confounding impact of currency valuation movements. We select those source (lending) banking system–host-country pairs for which the IBRN data set provides detailed prudential regulatory information for both the source banking system and the host country. The bilateral cross-border lending data set is also broken down by target (counterparty) sector, separately covering claims on host countries' banking and non-banking (including non-bank financials, such as insurance) sectors.

Visualization of the cross-border bank lending data offers two insights. First, the taper tantrum episode constituted a slowdown in cross-border bank lending flows (figure 1). Flows (measured here as two-quarter changes in cross-border lending volumes) to both advanced-economy and emerging market borrowers declined during the tantrum, followed by a recovery—mostly driven by flows to advanced-economy borrowers. Second, a comparison of post-taper-tantrum cross-border bank lending growth in borrowing countries characterized by high versus low levels (stringency) of macroprudential tools suggests that on average borrower countries with more accumulated macroprudential tools saw higher cross-border lending inflows (figure 2).

Given the substantial heterogeneity in the bilateral banking data, we winsorize the observations at the 5th and 95th percentile, as is

Figure 2. Average Post-Tantrum Lending Flows



Source: BIS banking statistics.
Note: See online file at http://www.ijcb.org for color version of this figure.

common in the related literature (for instance, Avdjiev and Takáts 2016; Takáts and Temesvary 2017). The reason is that the growth rate of smaller-volume bilateral lending pairs is very volatile, sometimes amounting to changes of several hundred percentage points. For instance, small idiosyncratic shocks, such as a new foreign direct investment (FDI) project, can substantially affect these smaller-scale relationships.

3.2 Data on Prudential Measures

Our database combines information on country-level macroprudential measures enacted during the period up to the taper tantrum, with detailed information on bilateral cross-border lending flows before and after the tantrum. Our data on country-level regulatory measures come from the macroprudential database employed by the 2016 IBRN project, also incorporating the 2013 Global Macro Prudential Instruments (GMPI) survey (Cerutti et al. 2016; Avdjiev et al. 2017; Berrospide et al. 2017; Cerrutti, Claessens, and Laeven 2017). Table 1 and table 10 (in the appendix) summarize and describe these indexes.

The IBRN database contains a mix of macroprudential measures and also standard (micro)prudential minimum capital requirements. More precisely, while eight out of the nine IBRN categories (sscb_res, sscb_cons, sscb_oth, concrat, ibex, ltv_cap, rr_foreign, and rr_local) are clearly macroprudential, the ninth index on capital requirements (cap_req) is less clearly macroprudential, as we explain in more detail

Table 1. Variable Definitions and Summary Statistics

Variables	Unit	Definition	Mean	SD	Min.	p25	p50	p75	Max.	N
Dependent Variables										
Change in Bilateral Lending Flows—Total	%	Change in total bilateral bank lending flows for each source–host pair, from before to after the taper tantrum; BIS banking statistics	5.231	48.03	−218.3	−9.343	3.728	21.5	195	1,875
Change in Bilateral Lending Flows—Banks	%	Defined as above, for claims on banks	2.309	81.53	−334.8	−16.95	3.312	30.86	268	1,599
Change in Bilateral Lending Flows—Non-banks	%	Defined as above, for claims on non-banks	5.19	42.6	−150.6	−12.43	2.792	25.34	125	1,743
Regulatory Indexes										
Cumulative Source Pruc6 Index	Integers	Country index by time t and country c, which is equal to 1 if the sum of eight macroprudential instruments (sscb_res, sscb_cons, sscb_oth, concrat, ibex, ltv_cap, rr_foreign, and rr_local, as defined in table 9) is greater than or equal to 1, is equal to –1 if the sum of the instruments is less than or equal to –1, and is 0 otherwise	0.998	2.022	−3	0	1	2	8	1,875

(continued)

Table 1. (Continued)

Variables	Unit	Definition	Mean	SD	Min.	p25	p50	p75	Max.	N
Regulatory Indexes										
Cumulative Host Pruc6 Index	Integers	Defined as source Pruc6 index, for host regulations	1.445	3.527	−5	0	1	3	16	1,875
Cumulative Source PruC Index	Integers	Defined as Pruc6 index, also including cap_req, as defined in table 9	2.002	2.349	−2	1	2	3	13	1,723
Cumulative Host PruC Index	Integers	Defined as source PruC index, for host regulations	2.591	4.535	−6	0	2	4	22	1,723
Cumulative Source sscb Index	Integers	Sum of sscb_res, sscb_cons, and sscb_oth (as defined in table 9) in the country in which the source banking system is located	0.191	0.882	−2	0	0	0	5	1,723
Cumulative Host sscb Index	Integers	Same as source sscb, for host country	0.375	1.188	−3	0	0	0	5	1,723
Additional Variables										
Bilateral Lending Flows—Total	%	Change in the natural logarithm of total bilateral bank lending claims for each source–host pair, from before to after the taper tantrum; BIS banking statistics	1.087	21.44	−83	−5.637	−0.823	4.712	191	1,875
Bilateral Lending Flows—Banks	%	Defined as above, for claims on banks	1.238	30.06	−83	−8.347	−1.743	6.673	191	1,628
Bilateral Lending Flows—Non-banks	%	Defined as above, for claims on non-banks	1.8	19.18	−60.4	−5.958	−0.177	7.062	90.2	1,784

(continued)

Table 1. (Continued)

Variables	Unit	Definition	Mean	SD	Min.	p25	p50	p75	Max.	N
Weights in Estimations										
Share of a Source–Host Pair in Aggregate Bilateral Total Claims	Ratio	Bilateral cross-border claims from banking system i to host country j at time t, divided by aggregate cross-border claims at time t (summed across all source–host pairs)	0.048	0.045	6.64E-06	0.014	0.032	0.067	0.21	1,875
Share of a Source–Host Pair in Aggregate Bilateral Claims on Banks	Ratio	Defined as share of total claims, for claims on banks	0.047	0.046	8.66E-06	0.013	0.03	0.069	0.2	1,663
Share of a Source–Host Pair in Aggregate Bilateral Claims on Non-banks	Ratio	Defined as share of total claims, for claims on non-banks	0.045	0.047	0	0.013	0.03	0.064	0.3	1,779

below. The precise description of the nine indexes is detailed in table 10 in the appendix.[2]

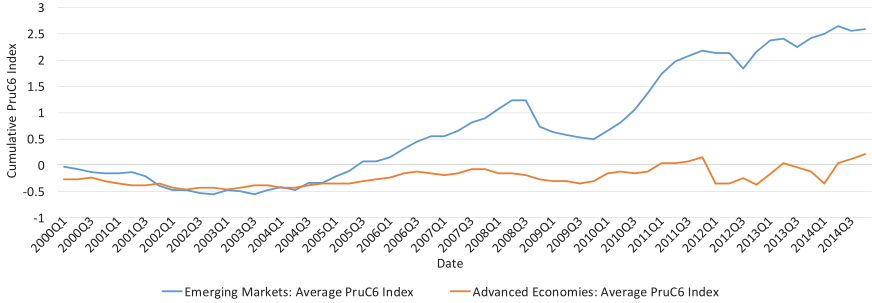
For our formal analysis, we create a new index of macroprudential tools (which we denote by Pruc6). This Pruc6 index is analogous to the pre-defined PruC index of the IBRN database, but excludes changes in capital requirements. More precisely, Pruc6 is a country index by time t and country c, which is equal to 1 if the sum of eight distinct macroprudential instruments (sscb_res, sscb_cons, sscb_oth, concrat, ibex, ltv_cap, rr_foreign, and rr_local) is greater than or equal to 1, is equal to -1 if the sum of the instruments is less than or equal to -1, and is 0 otherwise. In other words, our Pruc6 index is similar to the pre-defined Pruc index, only it excludes the impact of capital requirements (cap_req).

The rationale for excluding the cap_req (capital requirements) index is threefold. First is focus: we hone in on the efficiency of macroprudential instruments, while capital requirements generally belong to the category of microprudential instruments rather than macroprudential ones. Second is policy stance: changes in capital requirements mostly signal the adoption of the Basel III regime and thereby international harmonization. Hence, cumulative differences in country-specific capital indexes are more likely to reflect differences in prudential regulation at the start rather than at the end of the observation period. Third is the role of expectations: given that the adoption of Basel III was anticipated along country-specific timelines, the problem of expectations is the strongest for capital requirements. Nonetheless, despite these issues, we repeat our analysis for the pre-defined indexes to check robustness.

While the IBRN database is the most comprehensive and thorough database of country-specific macroprudential instruments,

[2]In addition, the IBRN database contains three pre-defined indexes. First, PruC is a country index by time t and country c, which is equal to 1 if the sum of nine distinct macroprudential instruments (shown in table 10) is greater than or equal to 1, is equal to -1 if the sum of the instruments is less than or equal to -1, and is 0 otherwise. Second, PruC2 denotes a country index by time t and country c, which is equal to 1 if the sum of the nine instruments is greater than or equal to 1, is equal to -1 if the sum of the instruments is less than or equal to -1, and is 0 otherwise. In this case, all individual instruments are adjusted to have maximum and minimum changes of 1 and -1. Third, sscb is the sum of changes in sector-specific capital buffers across the residential, consumer, and other sectors.

Figure 3. Average PruC6 Index in Advanced-Economy and Emerging Market Borrowers: 2000–14



Source: IBRN prudential regulatory database.
Note: See online file at http://www.ijcb.org for color version of this figure.

there are several issues associated with using this data, which we address in our analysis. First, there is the possibility of a confounding effect in that stricter macroprudential policy settings may signal (unobserved) vulnerability. Second, a cross-sectional analytical concern is that the IBRN macroprudential database does not measure the absolute level of policy stance at any given time: it shows *cumulative* actions taken relative to the start of the panel. Third, a time-series limitation is that the confounding effect of expectations complicates the identification of the timing of the regulatory spillovers. Fourth, we must consider the issue of asymmetry in that not all macroprudential actions have the same strength and effects.

For our analysis, we use a cumulative index that encompasses the entire available time series starting from 2000:Q1 up until the quarter prior to the beginning of the taper tantrum: 2013:Q1. The use of macroprudential tools was more active among emerging markets than among advanced economies, suggesting separate examination of the two groups of countries (figure 3). Importantly, our use of cumulative changes mitigates potential problems arising from the uncertainty of timing (i.e., whether or not the announcement was expected beforehand).

According to these measures, we see a general tightening of macroprudential policies across the countries in our sample over time, as shown in the summary statistics of table 1 as well as

figure 3 (see also IMF–FSB–BIS 2016). These averages, however, hide cross-sectional differences—with some countries, for instance, substantially tightening and others significantly easing their macroprudential policy stance during this period.

3.3 Additional Macro Controls

In specifications without host-country fixed effects, controls for macroeconomic effects on host-country credit demand may be needed. We run our benchmark regression without any specific macroeconomic control variables. However, we include such controls, such as the credit-to-GDP gap, credit growth, GDP growth, current-account-to-GDP ratio, and institutional quality measures in our extensive robustness checks.

4. Estimation Methodology

We employ a difference-in-difference methodology to compare the cross-section of bilateral cross-border lending flows before the taper tantrum with the cross-section immediately following the tantrum, as a function of ex ante macroprudential measures taken in source banking systems and host countries. In other words, we investigate the second derivatives of bank claims: their acceleration or slowdown.

Our main hypothesis is that *macroprudential tools in place, irrespective of the specific tool, increase the resilience of source banking systems and borrowers*. Hence, macroprudential tools applied in source (lending) banking systems strengthen lending banks by making their operations more prudent, thereby stabilizing the supply of cross-border lending during times of stress.[3] Similarly, macroprudential tools applied in host countries make local bank and non-bank borrowers more resilient. They do so by directly stabilizing banks' loan demand (i.e., interbank lending) as banks become more robust to shocks, and indirectly stabilizing the demand from non-banks (as the non-bank private sector also becomes more stable by curbing excessive borrowing).

[3]For alternative hypotheses on the role of source regulations in shaping cross-border lending outflows, please see the literature review in section 2.

Importantly, we do not formulate hypotheses around specific tools and their impact on cross-border bank lending. That is, we do not solely focus on direct effects, such as a tool specifically targeting lending denominated in a foreign currency that could improve international lending during stress. Rather, we are also interested in indirect effects. For instance, sector-specific capital buffers in real estate lending, a tool that is applied purely for domestic reasons, may also improve the resilience of the banking system in such a way that it is able to lend more to cross-border borrowers as well.

Our main explanatory variable is our index of applied macroprudential measures (Pruc6). As described above, we use the cumulative changes from the beginning of the sample (2000:Q1) up until the quarter immediately preceding the tantrum (2013:Q1) to proxy for ex ante bank macroprudential regulatory stringency at the country level.

In all specifications, $\Delta flows$ is the change in bilateral flows which themselves represent the log change of claims. Hence, our dependent variable is a second difference (i.e., change in the growth rate of claims). We always investigate the change before and after the taper tantrum. More precisely, we measure the change in claims from 2012:Q4 to 2013:Q1) compared with the change in claims after (from 2013:Q2 to 2013:Q3) the tantrum. In our regressions, we weigh the observations by the size of pre-tantrum (2013:Q1) bilateral exposures.

The shock-mitigating effects of macroprudential tools are two-sided: measures taken by both source banking systems and host countries can affect bank flows' resilience. The basic difference-in-difference regressions take the following form:

$$\Delta flows_{ij} = \beta_0 + \beta_1 source\_reg\_ind_j + \beta_2 dem\_host_i + \varepsilon_{ij} \quad (1)$$

$$\Delta flows_{ij} = \gamma_0 + \gamma_1 host\_reg\_ind_i + \gamma_2 dem\_source_j + \nu_{ij}. \quad (2)$$

In equation (1), we examine the shock-mitigating effect of source (lending) banking system macroprudential measures, while controlling for changes in the demand for credit at the host-country level through the use of fixed effects. Similarly, in equation (2) we focus on the role of host-country macroprudential stringency in mitigating the tantrum shock on bilateral cross-border bank inflows, while controlling for the supply side of credit through source fixed effects.

In equations (1) and (2) we include fixed effects on the lending or borrowing side, in order to control for unobserved country-level characteristics. We drop these fixed effects in equation (3) to be able to investigate regulatory effects on both sides simultaneously:

$$\Delta flows_{ij} = \delta_0 + \delta_1 host\_reg\_ind_i + \delta_2 source\_reg\_ind_j + \nu_{ij}. \quad (3)$$

In equation (3), we aim to assess the impact of both source- and host-country-specific macroprudential tools simultaneously.

Next, we also investigate the interaction between source and host macroprudential measures. Formally, in equation (4) we include a policy interaction term, and also apply source and host-country fixed effects:

$$\Delta flows_{ij} = \theta_0 + \theta_1 dem_{host_i} + \theta_2 dem_{source_j} + \theta_3 host\_reg\_ind_i * source\_reg\_ind_i + \nu_{ij}. \quad (4)$$

Similar to Khwaja and Mian (2008), this identification approach controls for any potential credit supply (source banking-system-specific) or demand (host-country-specific) effects simultaneously (Avdjiev and Takáts 2016). While this formulation identifies the policy interaction precisely, it also precludes us from being able to observe the impact of source and host measures in *levels*. In all estimations we cluster the standard errors across the source (lending) banking systems. For robustness, later we also cluster the standard errors along host countries.

5. Estimation Results

5.1 Macroprudential Measures Index: Source Banking Systems vs. Host Countries

We find broad evidence in the full sample that host countries which had taken macroprudential measures before the taper tantrum, as captured by our Pruc6 index, indeed had more-stable cross-border bank lending inflows (table 2). However, we do not find evidence of a significant regulatory impact of source lending systems on cross-border lending outflows.

Table 2. The Impact of the Macroprudential Regulations Index (Pruc6) on Changes in Lending Flows from Before to After the Taper Tantrum

Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Lending Flows by Borrower Sector:	**Total**	**Total**	**Total**	**Banks**	**Banks**	**Banks**	**Non-banks**	**Non-banks**	**Non-banks**
Variables									
Cumulative Source Pruc6 Index	0.147		0.111	0.291		0.175	−0.42		−0.471
	(0.79)		(0.749)	(1.392)		(1.282)	(1.31)		(1.332)
Cumulative Host Pruc6 Index		1.040***	1.035***		0.885**	1.029**		1.263***	1.079***
		(0.3)	(0.263)		(0.434)	(0.381)		(0.332)	(0.338)
Constant	−21.85	−0.559**	3.626**	39.14	−3.567***	1.479	−31.56*	0.750***	4.520**
	(15.99)	(0.219)	(1.429)	(30.99)	(0.404)	(2.121)	(17.41)	(0.181)	(1.972)
Observations	1,875	1,875	1,875	1,591	1,591	1,591	1,734	1,734	1,734
R-squared	0.06	0.06	0.01	0.06	0.05	0.00	0.07	0.10	0.01
Source Fixed Effects	No	Yes	No	No	Yes	No	No	Yes	No
Host Fixed Effects	Yes	No	No	Yes	No	No	Yes	No	No
Difference in the Tantrum Effect on Bilateral Lending Outflows from Banks in Source Banking Systems at the 90th versus the 10th Percentile of Pruc6 Index									
	0.88		0.664	1.75		1.047	−2.1		−2.35
Difference in the Tantrum Effect on Bilateral Lending Inflows to Borrowers in Host Countries at the 90th versus the 10th Percentile of Pruc6 Index									
		8.31	8.28		7.08	8.23		10.1	8.63

Notes: Table 2 shows the percentage point change in the taper tantrum effect on bilateral lending flows (measured as the change in outstanding bilateral bank claims from before to after the taper tantrum) in response to a one-unit change in the cumulative Pruc6 index. Summary statistics and variable definitions are shown in table 1. Robust standard errors are shown in parentheses below the coefficient estimates; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In more detail, in model 1 of table 2 we begin by estimating equation (1). In this specification we investigate the impact of macroprudential measures taken in the source (lending) jurisdiction, and use fixed effects to control for potential credit demand shocks at the host-country level. Model 1 suggests no statistically significant impact of source regulatory measures.

In contrast, in model 2 we estimate equation (2) and find significant effects. Recall that equation (2) examines the impact of macroprudential measures taken in the host jurisdiction, and uses fixed effects to control for potential credit supply impacts at the source level. The significant positive coefficient implies that from the perspective of a given source banking system, lending flows to a host country with an additional pre-crisis prudential measure declined by around 1 percentage point less (or accelerated more) than lending to borrowers in those host countries which had applied less macroprudential stringency.

In model 3 we simultaneously estimate the impact of both source and host macroprudential tools through equation (3). The coefficient estimate on the host-country regulatory index is similar in magnitude and significance to model 2, and thus confirms the significant shock-mitigating effect of host-country macroprudential rules.

We also examine the economic significance of our findings by comparing lending inflows into a host country with stricter macroprudential regulation (at the 90th percentile of the macroprudential regulation index) with inflows into a host country with less regulation (at the 10th percentile). We find that a more strictly regulated host country received around 8 percentage points more cross-border lending inflows than a less-regulated host country. Thus, our results are also economically significant.

Next, we delineate our sample by sectors: lending to banks (models 4–6) and to non-banks (models 7–9). The results show roughly the same picture as the aggregated analysis: macroprudential measures applied in host countries had a significant stabilizing effect in both target sectors, though somewhat stronger in lending to non-banks. These results hold irrespective of whether we control for credit supply-side effects (models 5 and 8) or include source rules as well (models 6 and 9).

5.2 Broader Macroprudential Indexes

We proceed by repeating the previous analysis now using a broad macroprudential index, the pre-defined overall PruC index, which also includes capital requirements in addition to the strictly macroprudential tools (table 3). The coefficient estimates show the same qualitative picture as those in table 2: the tantrum-shock-mitigating effect of host-country macroprudential rules remains significant. This is not surprising given the extent of the overlap between our index excluding prudential capital regulation (Pruc6) and the pre-defined index (PruC). These estimations further suggest that the significant results we find in models 1–3 are mostly driven by lending inflows into host countries' non-bank sectors (models 7–9). We find weaker interbank results (models 4–6).

In terms of economic significance, a host country with strict pre-tantrum broad macroprudential rules in place saw around 5 percentage point less reduction in its cross-border lending inflows than a host country with laxer broad macroprudential rules in place. This implied economic impact is smaller than those in table 2—consistent with the argument that during this period—i.e., the Basel III adoption phase—differences in capital requirement measures probably reflected more variation in the initial capital requirements than differences in the end-period capital requirements.

5.3 Advanced Economies and Emerging Markets

Next, we divide our sample across the host countries of borrowers, and reestimate our baseline specifications of table 2 for lending to borrowers in advanced economies (table 4) and emerging markets (table 5). These separate estimations reveal three main findings. First, the main pattern we detected in tables 2 and 3, namely the significant role of host-country macroprudential measures in stabilizing cross-border lending flows into hosts' non-bank sectors, is present both in lending to advanced economies and in lending to emerging markets. Second, similar to table 3, the results on interbank lending become statistically insignificant when we delineate the sample by borrower type. Third, the coefficient estimates on host macroprudential rules are larger and more statistically significant for borrowers in advanced economies than in the aggregated sample. As before,

Table 3. The Impact of the Pre-defined Prudential Regulations Index (PruC) on Changes in Lending Flows from Before to After the Taper Tantrum

Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Lending Flows by Borrower Sector:	**Total**	**Total**	**Total**	**Banks**	**Banks**	**Banks**	**Non-banks**	**Non-banks**	**Non-banks**
Variables									
Cumulative Source PruC Index	0.009		−0.032	0.129		0.007	−0.551		−0.545
	(0.593)		(0.566)	(1.128)		(1.104)	(1.344)		(1.352)
Cumulative Host PruC Index		0.581**	0.570***		0.48	0.585*		0.693***	0.571**
		(0.23)	(0.197)		(0.371)	(0.315)		(0.238)	(0.236)
Constant	−21.7	−0.691*	3.576**	39.2	−3.592***	1.34	−30.75*	0.540*	5.065*
	(16.04)	(0.352)	(1.675)	(31.3)	(0.657)	(2.405)	(17.3)	(0.308)	(2.78)
Observations	1,723	1,723	1,723	1,488	1,488	1,488	1,617	1,617	1,617
R-squared	0.06	0.06	0.003	0.06	0.05	0.001	0.07	0.09	0.004
Source Fixed Effects	No	Yes	No	No	Yes	No	No	Yes	No
Host Fixed Effects	Yes	No	No	Yes	No	No	Yes	No	No
Difference in the Tantrum Effect on Bilateral Lending Outflows from Banks in Source Banking Systems at the 90th versus the 10th Percentile of PruC Index									
	0.54		−0.19	0.78		0.05	−2.75		−2.73
Difference in the Tantrum Effect on Bilateral Lending Inflows to Borrowers in Host Countries at the 90th versus the 10th Percentile of PruC Index									
		5.81	5.70		4.32	5.26		6.23	5.14

Notes: Table 3 shows the percentage point change in the taper tantrum effect on bilateral lending flows (measured as the change in outstanding bilateral bank claims from before to after the taper tantrum) in response to a one-unit change in the cumulative PruC index. Summary statistics and variable definitions are shown in table 1. Robust standard errors are shown in parentheses below the coefficient estimates; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4. Borrowers in Advanced Economies: The Impact of the Macroprudential Regulations Index (Pruc6) on Changes in Lending Flows from Before to After the Taper Tantrum

Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Lending Flows by Borrower Sector:	**Total**	**Total**	**Total**	**Banks**	**Banks**	**Banks**	**Non-banks**	**Non-banks**	**Non-banks**
Variables									
Cumulative Source Pruc6 Index	0.282		0.221	0.355		−0.004	0.0153		0.123
	(0.997)		(0.938)	(1.699)		(1.559)	(1.135)		(1.117)
Cumulative Host Pruc6 Index		2.613***	2.590***		3.033	2.895		2.608***	2.608***
		(0.821)	(0.899)		(2.004)	(1.98)		(0.921)	(0.882)
Constant	16.73	−4.935***	2.659	25.08	−12.83***	−0.101	9.008	1.267***	3.850*
	(12.5)	(0.0522)	(1.752)	(18.43)	(0.764)	(2.683)	(7.592)	(0.124)	(2.212)
Observations	747	747	747	688	688	688	708	708	708
R-squared	0.05	0.11	0.01	0.06	0.08	0.01	0.05	0.13	0.02
Source Fixed Effects	No	Yes	No	No	Yes	No	No	Yes	No
Host Fixed Effects	Yes	No	No	Yes	No	No	Yes	No	No
Difference in the Tantrum Effect on Bilateral Lending Outflows from Banks in Source Banking Systems at the 90th versus the 10th Percentile of Pruc6 Index									
	1.41		1.107	2.13		−0.022	0.77		0.616
Difference in the Tantrum Effect on Bilateral Lending Inflows to Borrowers in Host Countries at the 90th versus the 10th Percentile of Pruc6 Index									
		13.06	12.95		15.17	14.47		13.06	13.04

Notes: Table 4 shows the percentage point change in the taper tantrum effect on bilateral lending flows (measured as the change in outstanding bilateral bank claims from before to after the taper tantrum) to borrowers in advanced economies, in response to a one-unit change in the cumulative Pruc6 index. Summary statistics and variable definitions are shown in table 1. Robust standard errors are shown in parentheses below the coefficient estimates; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5. Borrowers in Emerging Markets: The Impact of the Macroprudential Regulations Index (Pruc6) on Changes in Lending Flows from Before to After the Taper Tantrum

Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Lending Flows by Borrower Sector:	**Total**	**Total**	**Total**	**Banks**	**Banks**	**Banks**	**Non-banks**	**Non-banks**	**Non-banks**
Variables									
Cumulative Source Pruc6 Index	−0.414		−0.349	−0.297		0.0299	−1.255		−1.453
	(1.23)		(1.106)	(2.353)		(2.303)	(2.048)		(2.021)
Cumulative Host Pruc6 Index		0.656	0.549*		0.389	0.288		0.785**	0.715*
		(0.394)	(0.318)		(0.654)	(0.538)		(0.381)	(0.392)
Constant	−21.2	5.335***	6.112**	39.99	6.980***	5.909	−30.64*	0.992*	6.465**
	(16.05)	(0.614)	(2.257)	(31.31)	(1.027)	(4.344)	(17.07)	(0.57)	(2.391)
Observations	976	976	976	800	800	800	909	909	909
R-squared	0.07	0.06	0.003	0.06	0.08	0.001	0.09	0.1	0.01
Source Fixed Effects	No	Yes	No	No	Yes	No	No	Yes	No
Host Fixed Effects	Yes	No	No	Yes	No	No	Yes	No	No
Difference in the Tantrum Effect on Bilateral Lending Outflows from Banks in Source Banking Systems at the 90th versus the 10th Percentile of Pruc6 Index									
	−2.49		−2.097	−1.78		0.179	−7.53		−8.718
Difference in the Tantrum Effect on Bilateral Lending Inflows to Borrowers in Host Countries at the 90th versus the 10th Percentile of Pruc6 Index									
		6.56	5.49		3.89	2.88		7.85	7.15

Notes: Table 5 shows the percentage point change in the taper tantrum effect on bilateral lending flows (measured as the change in outstanding bilateral bank claims from before to after the taper tantrum) to borrowers in emerging markets, in response to a one-unit change in the cumulative Pruc6 index. Summary statistics and variable definitions are shown in table 1. Robust standard errors are shown in parentheses below the coefficient estimates; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

macroprudential tools applied in source (lending) banking systems are insignificant for lending flows into both advanced and emerging host countries.

In more detail, when we examine lending flows into advanced economies in table 4, the coefficient estimates on the host-country macroprudential tools are larger than in the aggregated sample. An additional macroprudential measure applied at the host-country level mitigated the tantrum shock on lending inflows by around 2.6 percentage points (model 2). In terms of economic significance, an advanced economy host with strict pre-tantrum regulations (at the 90th percentile) in place saw a notable 13 percentage point higher lending inflows than a host with laxer macroprudential rules (at the 10th percentile). The results for lending to all sectors (models 1–3) are clearly driven by our results for lending to non-banks (models 7–9).

Examining the macroprudential effects on lending inflows into emerging markets in table 5, we find that the impacts are smaller and generally less statistically significant. The coefficient estimates on host macroprudential rules hover in the 0.5–0.8 percentage point range, and remain consistently significant for lending to non-banks (models 8 and 9).[4] The potential of macroprudential policies to make lending inflows more resilient to the non-bank sector might be particularly relevant for emerging market policymakers because continued access to credit to non-banks is crucial for economic stability and long-term growth.

Consistently, the mitigating effects of host-country rules are economically significant for lending to borrowers in emerging markets as well. The impact amounts to a lending flow difference of around 8 percentage points when we compare cross-border inflows into the non-bank sectors of emerging market hosts at the 90th versus the 10th percentile of regulatory stringency.

In additional estimations, we also repeat the analysis for advanced and emerging markets separately using the pre-defined PruC index (tables 11 and 12). While the advanced-economy results

[4]Figure 3 suggests that the smaller coefficient estimates may in part be due to the regularity that emerging market macroprudential rules were on average stricter during the tantrum episode than those in advanced-economy hosts.

remain statistically significant (with the exception of interbank lending), the tantrum effect-mitigating role of macroprudential regulation in emerging host markets loses significance. These additional regressions suggest that we can observe a similar, but weaker, relationship between the general pre-defined PruC index and lending stability than the one with our more focused Pruc6 macroprudential index.

5.4 Individual Macroprudential Measure Categories

We also check how individual macroprudential tool categories affected cross-border lending during the taper tantrum (table 6). Earlier we found evidence for the impact of macroprudential tools enacted in host countries. Hence, now we focus on the results for individual macroprudential tool categories enacted in host countries. In order to gain a more representative picture, we look across all country pairs. Similarly, we consider total lending rather than breaking results into lending to bank and non-bank borrowers. Table 6 shows the impact of individual macroprudential tool categories one by one.

Three main findings stand out. First, some macroprudential tool groups seem to be significant even individually. The coefficients are significant on concentration limits (model 5, concrat) and on loan-to-value ratio caps (model 7, ltv_cap). Notably, the latter suggests that the robust role of host-country macroprudential rules in stabilizing lending inflows to the non-bank sector may work through stabilizing non-banks' credit demand, by increasing the resilience of these borrowers. The non-bank private sector might become more resilient, for instance, if macroprudential tools curb excessive borrowing before the shock or, alternatively, they direct funds to more creditworthy borrowers. In addition, we find a significant role for changes in local currency reserve requirements (model 9, rr_local) in mitigating the tantrum shock.

Second, the insignificance of most individual macroprudential tools suggests that it is the compounded effects of various tools that matters, rather than the application of one "key" tool. This is consistent with the observation that macroprudential tools aim to increase the resilience of the financial system or to contain the buildup of vulnerabilities.

Table 6. The Impact of Individual Macroprudential Regulation in Host Countries on Changes in Lending Flows from Before to After the Taper Tantrum

Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lending Flows by Borrower Sector:	Total	Total	Total	Total	Total	Total	Total	Total	Total
Variables									
Cumulative Host sscb Index on Residential Lending	1.878								
	(1.885)								
Cumulative Host sscb Index on Consumer Lending		0.984							
		(3.027)							
Cumulative Host sscb Index on Other Lending			0.395						
			(3.976)						
Cumulative Host cap_req				5.318					
				(4.615)					
Cumulative Host concrat Index					2.195*				
					(1.206)				
Cumulative Host ibex Index						0.996			
						(2.137)			
Cumulative Host ltv_cap							1.666**		
							(0.789)		
Cumulative Host rr_foreign								−0.343	
								(0.558)	
Cumulative Host rr_local									0.779*
									(0.405)
Constant	−0.273	0.133	0.115	−4.41	−0.826	−2.456	−4.587***	0.341	1.532**
	(0.475)	(0.208)	(0.868)	(3.865)	(0.927)	(2.658)	(0.743)	(0.228)	(0.693)
Observations	1,723	1,723	1,723	1,564	1,007	603	890	1,723	1,723
R-squared	0.056	0.056	0.056	0.062	0.072	0.184	0.09	0.056	0.057
Source Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Host Fixed Effects	No	No	No	No	No	No	No	No	No

Notes: Table 6 shows the percentage point change in the taper tantrum effect on bilateral lending flows (measured as the change in outstanding bilateral bank claims from before to after the taper tantrum), in response to a one-unit change in the regulatory sub-index as shown. Summary statistics and variable definitions are shown in table 1. Robust standard errors are shown in parentheses below the coefficient estimates; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Third, the capital requirement prudential tool (model 4, cap_req) is also insignificant. This further confirms our reasoning in subsection 5.2, namely that excluding capital requirements from the main analysis is reasonable not only based on the definition of macroprudential tools but also from an empirical perspective.

The interpretation of these tool-specific results needs to be rather cautious. Importantly, we do not see our results as ranking macroprudential tools by effectiveness for cross-border bank lending stabilization. Overall, our main body of evidence suggests that macroprudential tools work together to increase the resilience of the financial system. Therefore, we take the results of table 6 to generally suggest that the significant impact of some of the individual tools, as well as the marked differences across tools, shall serve as solid motivation for future research on comparing and contrasting the effectiveness of individual tools.

5.5 Interaction of Source and Host Regulations

In studying the stabilizing roles of source and host macroprudential rules simultaneously, the question which naturally arises is: how do these macroprudential policies interact? We address this question in table 7. Models 1–3 examine all borrower countries, while models 4–6 and models 7–9 delineate the sample by advanced-economy and emerging market borrowers, respectively. For each sample, we examine the roles of the levels of source (models 1, 4, and 7) and host (models 2, 5, and 8) regulations as well as their interactions, employing one-sided fixed effects to control for unobservable credit shocks. The application of fixed effects follows and extends the Khwaja and Mian (2008) type of identification applied on both sides in bilateral lending relationships, as in Avdjiev and Takáts (2016). We then investigate the interaction of source and host regulatory rules by estimating equation (4)—applying fixed effects both across source (lending) banking systems and across host countries (models 3, 6, and 9). By doing so, we isolate the interaction of source and host macroprudential measures from any unobservable host-country-specific credit demand or source (lending) banking-system-specific credit supply shocks.

Our estimations show no evidence of interactions between source and host regulatory stringency, including those specifications with

Table 7. Interaction of Source and Host Regulations: The Impact of Interaction between Source- and Host-Country Macroprudential Regulations on Changes in Lending Flows from Before to After the Taper Tantrum

Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Lending Flows by Host Country:	**Full Sample**			**Advanced Economies**			**Emerging Markets**		
Lending Flows by Borrower Sector:	**Total**	**Total**	**Total**	**Total**	**Total**	**Total**	**Total**	**Total**	**Total**
Variables									
Cumulative Source Pruc6 Index	0.24			0.345			−0.382		
	(0.922)			(0.978)			(1.745)		
Source Pruc6 Index*Host Pruc6 Index	−0.0527	−0.0852	−0.0443	−0.218	−0.29	−0.291	−0.00772	0.126	0.143
	(0.137)	(0.189)	(0.196)	(0.369)	(0.351)	(0.355)	(0.188)	(0.286)	(0.316)
Cumulative Host Pruc6 Index		1.142***			2.855***			0.511	
		(0.279)			(0.819)			(0.341)	
Constant	−22.27	−0.758*	−26.9	17.19	−4.988***	11.9	−21.28	5.954***	−22.67
	(16.12)	(0.392)	(16.82)	(12.36)	(0.0754)	(12.6)	(16.42)	(1.165)	(18.95)
Observations	1,875	1,875	1,875	747	747	747	976	976	976
R-squared	0.056	0.063	0.115	0.048	0.11	0.15	0.072	0.062	0.133
Source Fixed Effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Host Fixed Effects	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
Difference in the Tantrum Effect on Bilateral Lending Outflows from Banks in Source Banking Systems at the 90th versus the 10th Percentile of Pruc6 Index									
	0.985	−0.738	−0.35	1.397	−0.44	−1.31	−2.466	2.853	1.61
Difference in the Tantrum Effect on Bilateral Lending Inflows to Borrowers in Host Countries at the 90th versus the 10th Percentile of Pruc6 Index									
	−0.42	8.45	−0.384	−0.98	12.96	−0.441	−0.09	6.53	3.243

Notes: Table 7 shows the percentage point change in the taper tantrum effect on bilateral lending flows (measured as the change in outstanding bilateral bank claims from before to after the taper tantrum), in response to a one-unit change in the cumulative Pruc6 index. Summary statistics and variable definitions are shown in table 1. Robust standard errors are shown in parentheses below the coefficient estimates; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

fixed effects on both the source and host sides. Estimating equation (4) for all countries (model 3), for borrowers in advanced-economy hosts (model 6), and in emerging market hosts (model 9) all yield statistically insignificant coefficients. The results remain insignificant when we delineate the sample by target sector (bank and non-bank lending, results available upon request). This suggests that macroprudential tools applied in source (lending) banking systems and in host countries did not significantly strengthen or weaken each other's lending shock-mitigating impact during the taper tantrum.

However, the results for the regressions which include the levels of regulatory stringency together with the interaction term confirm our earlier results. The significant shock-mitigating impact of host-country macroprudential regulations is evident even after the inclusion of the interaction term, while the role of source regulations remains insignificant (see models 1, 2, 4, 5, 7, and 8). In other words, our main results are robust to controlling for potential source–host regulatory interactions.

Of course, this is not the final word on possible interactions associated with the application of macroprudential tools. We should be cautious before dismissing the potential cross-border interaction of macroprudential tools for three main reasons. First, our methodology of two-dimensional fixed effects in a single cross-section is very demanding of our data. Second, we focus on the taper tantrum episode alone—such regulatory interaction effects might be observed during other stress episodes or during "normal" times. Third, our regressions measure direct interactions, while macroprudential policies may affect lending behavior indirectly.

6. Robustness Checks

We undertake a number of robustness tests to ensure that our results hold under various specifications. Most importantly, we add a number of control variables to confirm that our main results do not stem from omitted-variables bias (table 8). Specifically, in panel A of table 8 we first add the pre-tantrum credit-to-GDP gap of source and host countries to our table 2 specifications. We then include average credit growth over 2009–12 in panel B; average GDP growth over 2009–12 in panel C; and the average current-account-to-GDP ratio over 2009–12 in panel D. In panel E, we add a measure of

Table 8. Robustness Checks

Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Lending Flows by Borrower Sector:	**Total**	**Total**	**Total**	**Banks**	**Banks**	**Banks**	**Non-banks**	**Non-banks**	**Non-banks**
Variables									
A. Credit Gap									
Cumulative Source PruC6 Index		−0.919	−0.872		0.0152	−0.421		−1.484	−1.417
		(0.975)	(0.988)		(1.557)	(1.368)		(1.423)	(1.382)
Source Credit Gap		0.402**	0.385**		0.0448	0.047		0.449**	0.490**
		(0.147)	(0.141)		(0.256)	(0.213)		(0.205)	(0.183)
Cumulative Host PruC6 Index	0.749*		0.689*	0.759		0.611	1.039***		0.967**
	(0.395)		(0.384)	(0.612)		(0.539)	(0.367)		(0.385)
Host Credit Gap	0.241		0.271	0.221		0.254	0.176		0.198
	(0.163)		(0.163)	(0.316)		(0.314)	(0.121)		(0.122)
Observations	1,380	1,672	1,210	1,244	1,440	1,108	1,272	1,566	1,136
R-squared	0.08	0.07	0.02	0.05	0.06	0.00	0.11	0.08	0.03
B. Credit Growth									
Cumulative Source PruC6 Index		−0.722	−0.736		−1.422	−1.899		−0.398	−0.188
		(1.069)	(1.125)		(1.856)	(1.410)		(1.575)	(1.633)
Source Credit Growth		0.897	0.876		1.834	1.864		−0.0811	−0.154
		(0.860)	(0.876)		(1.345)	(1.154)		(0.720)	(0.758)
Cumulative Host PruC6 Index	1.327***		1.273***	1.607		1.386	1.334**		1.406***
	(0.446)		(0.454)	(1.163)		(1.169)	(0.513)		(0.503)
Host Credit Growth	−0.229		−0.275	−0.548		−0.472	−0.0288		−0.237
	(0.355)		(0.400)	(1.179)		(1.211)	(0.380)		(0.415)
Observations	1,380	1,672	1,210	1,244	1,440	1,108	1,272	1,566	1,136
R-squared	0.08	0.06	0.01	0.05	0.06	0.01	0.11	0.07	0.01

(*continued*)

Table 8. (Continued)

Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lending Flows by Borrower Sector:	Total	Total	Total	Banks	Banks	Banks	Non-banks	Non-banks	Non-banks
Variables									
C. GDP Growth									
Cumulative Source PruC6 Index		0.581	0.391		0.631	0.203		−0.408	−0.459
		(0.810)	(0.743)		(1.556)	(1.395)		(1.517)	(1.512)
Source GDP Growth		−0.75	−0.477		−0.617	−0.204		−0.0601	0.0121
		(0.886)	(0.823)		(1.662)	(1.549)		(0.948)	(0.943)
Cumulative Host PruC6 Index	1.017*		1.086**	0.297		0.525	1.416**		1.323**
	(0.533)		(0.508)	(1.236)		(1.195)	(0.543)		(0.538)
Host GDP Growth	0.0466		−0.082	1.136		0.96	−0.324		−0.521
	(0.743)		(0.742)	(1.965)		(1.943)	(0.737)		(0.740)
Observations	1,876	1,851	1,851	1,592	1,576	1,576	1,734	1,718	1,718
R-squared	0.06	0.06	0.01	0.05	0.06	0.00	0.10	0.07	0.01
D. Current Account Balance									
Cumulative Source PruC6 Index		−0.155	−0.213		0.85	0.688		−1.35	−1.424
		(0.907)	(0.878)		(1.313)	(1.286)		(1.412)	(1.397)
Source Current Account Balance		0.362	0.376		−0.785	−0.736		1.160***	1.160***
		(0.334)	(0.337)		(0.509)	(0.472)		(0.293)	(0.287)
Cumulative Host PruC6 Index	1.010***		1.002***	0.761		0.918*	1.199***		1.044***
	(0.322)		(0.289)	(0.482)		(0.453)	(0.340)		(0.346)
Host Current Account Balance	0.0655		0.075	0.265		0.233	0.184		0.225
	(0.342)		(0.338)	(0.584)		(0.582)	(0.206)		(0.206)
Observations	1,855	1,851	1,830	1,584	1,576	1,568	1,713	1,718	1,697
R-squared	0.06	0.06	0.01	0.05	0.06	0.01	0.10	0.09	0.03
Source FE	Yes	No	No	Yes	No	No	Yes	No	No
Host FE	No	Yes	No	No	Yes	No	No	Yes	No

(*continued*)

Table 8. (Continued)

Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lending Flows by Borrower Sector:	Total	Total	Total	Banks	Banks	Banks	Non-banks	Non-banks	Non-banks
Variables									
E. Controlling for Institutional Quality									
Cumulative Source PruC6 Index		0.0585	0.152		0.126	0.136		−0.414	−0.394
		(0.725)	(0.654)		(1.350)	(1.221)		(1.298)	(1.295)
Source DTF—Ease of Doing Business		−0.506**	−0.473**		−0.491	−0.479		−0.33	−0.31
		(0.219)	(0.220)		(0.324)	(0.336)		(0.234)	(0.237)
Cumulative Host PruC6 Index	0.971***		1.023***	0.784*		1.005**	1.149***		1.006***
	(0.280)		(0.248)	(0.444)		(0.409)	(0.325)		(0.323)
Host DTF—Ease of Doing Business	0.0797		0.123	0.0226		0.0237	0.161		0.238*
	(0.141)		(0.154)	(0.352)		(0.349)	(0.110)		(0.121)
Observations	1,695	1,724	1,695	1,461	1,489	1,461	1,589	1,617	1,589
R-squared	0.06	0.07	0.01	0.05	0.06	0.00	0.10	0.07	0.01
F. Cumulating PruC6 Index Starting 2010									
Cumulative Source PruC6 Index		1.211	1.057		0.0637	−0.549		2.226	2.319
		(1.330)	(1.298)		(2.071)	(1.940)		(1.535)	(1.476)
Cumulative Host PruC6 Index	1.907**		1.770**	1.63		1.784	1.456		0.963
	(0.836)		(0.829)	(1.500)		(1.497)	(0.926)		(0.991)
Observations	1,723	1,723	1,723	1,488	1,488	1,488	1,617	1,617	1,617
R-squared	0.06	0.06	0.01	0.05	0.06	0.00	0.09	0.07	0.01
Source FE	Yes	No	No	Yes	No	No	Yes	No	No
Host FE	No	Yes	No	No	Yes	No	No	Yes	No

(*continued*)

Table 8. (Continued)

Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lending Flows by Borrower Sector:	Total	Total	Total	Banks	Banks	Banks	Non-banks	Non-banks	Non-banks
Variables									
G. Excluding Local Reserve Requirements									
Cumulative Source PruC6 Index		−0.0361	−0.152		−0.316	−0.357		−0.206	−0.283
		(0.751)	(0.713)		(1.251)	(1.162)		(1.300)	(1.300)
Cumulative Host PruC6 Index	1.192***		1.188***	1.117*		1.268**	1.393***		1.206**
	(0.366)		(0.328)	(0.575)		(0.508)	(0.469)		(0.478)
Observations	1,875	1,875	1,875	1,591	1,591	1,591	1,734	1,734	1,734
R-squared	0.06	0.06	0.01	0.05	0.06	0.00	0.10	0.07	0.01
H. Focusing on USD-Denominated Flows									
Cumulative Source PruC6 Index		1.434	1.201		4.088	3.872		0.55	−0.0616
		(3.420)	(3.308)		(3.737)	(3.597)		(3.690)	(3.635)
Cumulative Host PruC6 Index	1.549***		1.301**	1.366		1.088	2.151***		1.734**
	(0.535)		(0.508)	(0.844)		(0.906)	(0.692)		(0.788)
Observations	1,493	1,493	1,493	1,120	1,120	1,120	1,319	1,319	1,319
R-squared	0.15	0.08	0.00	0.09	0.12	0.00	0.13	0.08	0.01
Source FE	Yes	No	No	Yes	No	No	Yes	No	No
Host FE	No	Yes	No	No	Yes	No	No	Yes	No

Notes: Table 8 shows the percentage point change in the taper tantrum effect on bilateral lending flows (measured as the change in outstanding bilateral bank claims from before to after the taper tantrum), in response to a one-unit change in the cumulative macroprudential regulatory index. The results in panels A and B control for source- or host-country credit-to-GDP gap and credit growth, respectively. In panels C and D, the added controls are GDP growth and current account balance of source or host countries, respectively. The results in panel E control for institutional quality of the source and host countries. The results in panels F and G use alternative PruC indexes: one cumulating starting in 2010 and one excluding local currency reserve requirements, respectively. Lastly, panel H shows results for estimations using only USD-denominated lending flows in the calculation of the dependent variable. Summary statistics and variable definitions are shown in table 1. Robust standard errors are shown in parentheses below the coefficient estimates; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

host-country institutional quality: the World Bank's ease of doing business index. Among these controls, we find that source credit-to-GDP gap is positively related to interbank lending flows during the taper tantrum, as is the source current account balance in lending to non-banks. We also find that source institutional quality amplified, while host institutional quality somewhat mitigated the tantrum shock to cross-border lending flows. In general, the estimates confirm our benchmark results from table 2: host-country macroprudential measures seem to stabilize cross-border bank lending inflows, and this effect is stronger for lending to non-banks than for interbank lending.

A second potential concern relates to the robustness of our results to the specific method of how we constructed our main PruC6 regulatory index. We show that using the pre-defined PruC index (which includes capital requirements as well) does not materially affect our benchmark results (tables 3, 11, and 12). Furthermore, in order to examine the robustness of our results to variations to the IBRN database's particular index construction method, we create a new index similar to our Pruc6 index with the same eight sub-indexes—but without constraining the quarterly index value on the {–1, 0, 1} spectrum. Again, the results remain robust and only marginally weaker (detailed results are available upon request).

Third, we address concerns that the long period (2000–12) over which our regulatory index accumulates may drive our results. This long accumulation period might lead to reverse causality (due to more sustained booms leading to larger accumulation of macroprudential tools, for instance) or to increased noise (due to early-2000s policies becoming less relevant by the time of the taper tantrum, for instance). To address such concerns related to a long accumulation period, we define a new PruC7 index which cumulates macroprudential policies only after the financial crisis (starting in 2010:Q1), and use this measure to reestimate our benchmark estimations. Our main results remain robust, but again with interbank lending coefficients losing significance (table 8, panel F).

A fourth concern is that the inclusion of local currency requirements among the macroprudential policies in the construction of our PruC6 index may bias our results. This may be the case since these local currency reserve requirements may in some instances be used as a monetary policy tool (in lieu of policy interest rates, particularly

in emerging markets). When we reconstruct our macroprudential index without local currency reserve requirements and reestimate our benchmark specifications (table 8, panel G), we observe coefficient estimates that are closely comparable in significance to our benchmark table 2 results. This suggests that local currency reserve requirements are not a key driver of our results—and also further confirms our benchmark specifications.

A fifth robustness check concerns the currency denomination of cross-border bank lending flows. More specifically, we examine the possibility that macroprudential policies had potentially stronger effects of USD-denominated lending during the taper tantrum. Avdjiev and Takáts (2016) show that cross-border bank lending declined more in bilateral lending relationships with higher USD shares. Furthermore, evidence from Takáts and Temesvary (2017) points to currency denomination to be a channel of monetary policy transmission. These results may imply that the taper tantrum, a U.S.-related financial shock, might affect USD-denominated lending disproportionately. We redefine our dependent variable to include only USD-denominated lending flows, and reestimate our benchmark specifications (table 8, panel H). We find that host-country macroprudential policies indeed had a larger stabilizing impact on USD-denominated lending inflows to the non-bank sector than on flows measured across all currencies. The implication is that host-country macroprudential measures in place are particularly potent in stabilizing lending flows in the currency whose issuing country the financial shock originates from—and this is particularly so for lending to non-banks, the sector whose uninterrupted credit access is particularly important for robust real economic activity. This result is thus important from a policy perspective as well.

Furthermore, the main thrust of the results remains robust even when we specify a longer crisis window: we reestimate our benchmark specifications comparing changes in lending flows from two quarters before with two quarters after the taper tantrum (as opposed to the one quarter pre- and post-tantrum formulation in the benchmark specifications). The results are again comparable and we continue to see a significant stabilizing impact of macroprudential rules on lending to non-banks, with coefficient estimates similar in magnitude to our benchmark results. This finding confirms that the time window specification is a not a key driver of our results.

In addition, our benchmark table 2 results remain generally robust to the following variations on our baseline specifications (detailed results available upon request):

- clustering standard errors along host countries,
- no clustering of standard errors,
- dropping source (lending) banking systems one by one from the sample (to ensure that outliers do not drive the results),
- dropping the host countries of borrowers one by one from the sample (for the same reason as above).

Another feature of our analysis that we examine more closely is the use of nationality-based banking statistics. In order to provide more insight into the role of this choice, we reestimate our benchmark specifications on residence-based data (which links lending countries to borrowing countries; table 13 in the appendix). We find evidence that host-country macroprudential tools stabilized total cross-border lending inflows during the taper tantrum, though the sector-specific results are weaker. The result is not fully surprising given the similarity between the residence- and nationality-based data sets in most jurisdictions in our sample (apart from financial centers). We attribute the somewhat weaker results in the residence-based data mainly to the fact that by construction in the residence-based data our fixed effects are generally less potent in capturing unobservable differences across lending banking systems. This might in turn provide for a less clear identification.

Lastly, in order to control for the potential confounding effects of cross-country differences in monetary policy in our results, we investigate how the impact of macroprudential policies worked in an area with uniform monetary policy: within the euro zone. We run estimations in which we constrain our sample to intra-euro-area lending, i.e., including only country pairs where both source (lending) banking systems and host countries of borrowers are located in the euro area. These intra-euro-area results (table 14 in the appendix) are generally in line with our earlier findings. Though the coefficients remain significant in the overall sample, statistical significance declines in the sector-specific delineations, perhaps reflecting the smaller number of observations and less cross-country variation in macroprudential rules.[5]

[5]Our benchmark results also remain significant in the ex-euro-area sample.

7. Caveats

There are some caveats which deserve consideration in interpreting our results. First, we must consider the possibility that changes in macroprudential tools are endogenous, i.e., they also signal macroeconomic or financial vulnerabilities of either the source (lending) banking system or the host country of borrowers. This would imply that one could observe a negative association between the application of macroprudential tools and the resilience of cross-border bank lending. However, this vulnerability signaling effect, to the degree it exists in the data, would work against the significance of our results, as it would imply weaker or outright negative coefficient estimates. Furthermore, the potential existence of such a signaling effect suggests that our results should be seen as a lower bound on the impact of macroprudential tools.

Second, the IBRN macroprudential database does not contain information on the stance of individual macroprudential policy tools, which would allow cross-sectional comparison at a given point in time. Furthermore, we have no objective measure on how large a financial shock the taper tantrum constituted. Combined, these factors make it more difficult to precisely interpret the economic impact we show. While it is clear that we identify an economically significant lending stabilization in the context of the taper tantrum shock, it is less clear how much stabilization a marginal macroprudential policy action would yield during other economic shocks.

Third, there are potentially relevant non-linearities in the relationship between macroprudential stringency and cross-border lending stabilization. As we examine the circumstances of a particular identified shock—the taper tantrum—our results do not make precise predictions about the potential lending effects of other, different global funding shocks. Therefore, our estimates should be read as suggesting that macroprudential tools can have a sizable stabilizing impact during a stress scenario—not as a precise calibration.

Fourth, a potential complication is that the timing of the effective implementation of tighter macroprudential measures is unknown, and thereby the effects can be confounded by expectations. Regulatory actions are often expected beforehand, and the same is true for macroprudential measures. Our methodology, choosing a long window prior to the tantrum episode, largely addresses this concern.

While our results hold for shorter windows as well, the potential role of these expectations implies that applying even shorter time windows biases the analysis against finding significant results, because macroprudential actions in any given short window might have been expected beforehand.

Finally, we find heterogeneity in the lending-stabilization impact of macroprudential tools, across host countries (borrowers in advanced economies versus in emerging markets), counterparties (bank versus non-bank borrowers), and macroprudential tools. Hence, our results should be read at most as providing broad support for the role of macroprudential tools in stabilizing cross-border bank lending, rather than as assessing specific tools or their effect on specific countries or sectors.

8. Conclusion

We show that macroprudential tools applied prior to the U.S. taper tantrum episode helped to stabilize lending during the tantrum. Most importantly, macroprudential tools enacted in the host countries of borrowers stabilized cross-border bank lending significantly. The impacts are stronger for borrowers in advanced economies than for borrowers in emerging markets, and are also economically significant. Although the effect is present in lending to both bank and non-bank borrowers, the statistical significance of our results for lending to non-banks is less robust.

The results are relevant for policymakers: they demonstrate that macroprudential tools not only stabilize the domestic financial system directly but also make cross-border bank lending inflows into host economies more stable. The results which show strong and significant effects for macroprudential tools applied in host countries suggest that, though international coordination can play a useful role, it is paramount that countries "keep their house in order." While we do not find significant evidence for direct policy interactions, this does not imply that externalities do not exist. More financial stability in one country could indirectly enhance financial stability elsewhere.

We hope that our results will pave the way for future research—which, together with our findings, will help us better understand the international ramifications of macroprudential policies.

Appendix

Table 9. Characterization of the BIS IBS Stage 1 Enhanced Data

Breakdown of Data	Currency Composition	Residence of Borrower	Nationality of Lending Bank
Consolidated Data	No	Yes	No
Locational Data			
By Residence	Yes	Yes	No
By Nationality	Yes	No	Yes
Stage 1 Data	Yes	Yes	Yes

Table 10. Types of Prudential Indexes

Nine Categories	
sscb_res	Change in sector-specific capital buffer: Real estate credit. Requires banks to finance a larger fraction of these exposures with capital.
sscb_cons	Change in sector-specific capital buffer: Consumer credit. Requires banks to finance a larger fraction of these exposures with capital.
sscb_oth	Change in sector-specific capital buffer: Other sectors. Requires banks to finance a larger fraction of these exposures with capital.
cap_req	Change in capital requirements. Implementation of Basel capital agreements.
concrat	Change in concentration limit. Limits banks' exposures to specific borrowers or sectors.
ibex	Change in interbank exposure limit. Limits banks' exposures to other banks.
ltv_cap	Change in the loan-to-value ratio cap. Limits on loans to residential borrowers.
rr_foreign	Change in reserve requirements on foreign-currency-denominated accounts.
rr_local	Change in reserve requirements on local-currency-denominated accounts.

Table 11. Borrowers in Advanced Economies: The Impact of Prudential Regulation (PruC) Interaction on Changes in Lending Flows from Before to After the Taper Tantrum

Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Lending Flows by Borrower Sector:	**Total**	**Total**	**Total**	**Banks**	**Banks**	**Banks**	**Non-banks**	**Non-banks**	**Non-banks**
Variables									
Cumulative Source PruC Index	0.0207		−0.0281	−0.197		−0.511	−0.0139		0.109
	(0.756)		(0.728)	(1.38)		(1.296)	(1.1)		(1.087)
Cumulative Host PruC Index		2.367**	2.409**		2.939	2.821		2.302**	2.350***
		(1.099)	(1.129)		(2.38)	(2.351)		(0.863)	(0.824)
Constant	17.04	−7.311***	0.811	25.99	−15.89***	−1.59	9.05	−1.04	1.721
	(12.52)	(1.18)	(2.208)	(18.7)	(3.416)	(3.781)	(7.434)	(0.733)	(3.005)
Observations	747	747	747	688	688	688	708	708	708
R-squared	0.05	0.11	0.01	0.06	0.08	0.01	0.05	0.13	0.01
Source Fixed Effects	No	Yes	No	No	Yes	No	No	Yes	No
Host Fixed Effects	Yes	No	No	Yes	No	No	Yes	No	No
Difference in the Tantrum Effect on Bilateral Lending Outflows from Banks in Source Banking Systems at the 90th versus the 10th Percentile of PruC Index									
	0.1		−0.14	−0.98		−2.55	−0.07		0.543
Difference in the Tantrum Effect on Bilateral Lending Inflows to Borrowers in Advanced Host Economies at the 90th versus the 10th Percentile of PruC Index									
		11.83	12.05		14.69	14.1		11.51	11.75

Notes: Table 11 shows the percentage point change in the taper tantrum effect on bilateral lending flows (measured as the change in outstanding bilateral bank claims from before to after the taper tantrum) to borrowers in advanced economies, in response to a one-unit change in the cumulative PruC index. Summary statistics and variable definitions are shown in table 1. Robust standard errors are shown in parentheses below the coefficient estimates; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 12. Borrowers in Emerging Markets: The Impact of Prudential Regulation (PruC) on Changes in Lending Flows from Before to After the Taper Tantrum

Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Lending Flows by Borrower Sector:	**Total**	**Total**	**Total**	**Banks**	**Banks**	**Banks**	**Non-banks**	**Non-banks**	**Non-banks**
Variables									
Cumulative Source PruC Index	−0.00813		−0.0606	0.633		0.745	−1.317		−1.421
	(0.959)		(0.853)	(1.865)		(1.879)	(1.878)		(1.847)
Cumulative Host PruC Index		0.216	0.164		0.037	0.005		0.267	0.248
		(0.294)	(0.236)		(0.521)	(0.415)		(0.238)	(0.248)
Constant	−21.66	5.901***	7.022***	37.79	7.512***	5.481	−28.98*	1.655***	9.082***
	(16.4)	(0.62)	(2.559)	(32.24)	(1.125)	(4.323)	(16.79)	(0.457)	(3.127)
Observations	976	976	976	800	800	800	909	909	909
R-squared	0.07	0.06	0.001	0.06	0.08	0.001	0.1	0.09	0.01
Source Fixed Effects	No	Yes	No	No	Yes	No	No	Yes	No
Host Fixed Effects	Yes	No	No	Yes	No	No	Yes	No	No
Difference in the Tantrum Effect on Bilateral Lending Outflows from Banks in Source Banking Systems at the 90th versus the 10th Percentile of PruC Index									
	−0.05		−0.36	3.80		4.47	−7.90		−8.52
Difference in the Tantrum Effect on Bilateral Lending Inflows to Borrowers in Emerging Host Markets at the 90th versus the 10th Percentile of PruC Index									
		3.03	2.30		0.52	0.07		3.74	3.47

Notes: Table 12 shows the percentage point change in the taper tantrum effect on bilateral lending flows (measured as the change in outstanding bilateral bank claims from before to after the taper tantrum) to borrowers in emerging markets, in response to a one-unit change in the cumulative PruC index. Summary statistics and variable definitions are shown in table 1. Robust standard errors are shown in parentheses below the coefficient estimates; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 13. Residence-Based Data: The Impact of Prudential Regulation (PruC6) on Changes in Lending Flows from Before to After the Taper Tantrum

Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Lending Flows by Borrower Sector:	**Total**	**Total**	**Total**	**Banks**	**Banks**	**Banks**	**Non-banks**	**Non-banks**	**Non-banks**
Variables									
Cumulative Source PruC6 Index	−0.339		−0.261	−0.403		−1.034	0.343		0.397
	(0.866)		(0.830)	(1.044)		(1.161)	(0.889)		(0.837)
Cumulative Host PruC6 Index		1.268***	1.169***		2.196	2.384*		0.24	0.194
		(0.275)	(0.248)		(1.337)	(1.310)		(0.323)	(0.333)
Observations	1,094	1,094	1,094	924	924	924	1,026	1,026	1,026
R-squared	0.04	0.09	0.01	0.09	0.09	0.01	0.05	0.04	0.00
Source Fixed Effects	No	Yes	No	No	Yes	No	No	Yes	No
Host Fixed Effects	Yes	No	No	Yes	No	No	Yes	No	No
Difference in the Tantrum Effect on Bilateral Lending Outflows from Banks in Source Countries at the 90th versus the 10th Percentile of PruC6 Index									
	−1.7		−1.3	−2.01		−5.17	1.37		1.59
Difference in the Tantrum Effect on Bilateral Lending Inflows to Borrowers in Host Countries at the 90th versus the 10th Percentile of PruC6 Index									
		8.87	8.19		13.17	14.31		1.68	1.36

Notes: Table 13 shows the percentage point change in the taper tantrum effect on residence-based bilateral lending flows (measured as the change in outstanding residence-based bilateral bank claims from before to after the taper tantrum), in response to a one-unit change in the cumulative PruC6 index. Summary statistics and variable definitions are shown in table 1. Robust standard errors are shown in parentheses below the coefficient estimates; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 14. Intra-Euro-Area Lending: The Impact of Macroprudential Regulation (Pruc6) on Changes in Lending Flows from Before to After the Taper Tantrum

Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Lending Flows by Borrower Sector:	**Total**	**Total**	**Total**	**Banks**	**Banks**	**Banks**	**Non-banks**	**Non-banks**	**Non-banks**
Variables									
Cumulative Source Pruc6 Index	−0.209		−0.149	−0.711		−0.939	0.946		0.971
	(1.211)		(1.163)	(2.26)		(2.109)	(2.128)		(1.995)
Cumulative Host Pruc6 Index		2.179**	2.103**		3.44	3.075		1.877	1.980*
		(0.98)	(0.88)		(2.196)	(2.049)		(1.072)	(1.027)
Constant	−14.34	1.364	2.734	−18.52	−1.103	2.491	−7.311	0.816	2.436
	(8.365)	(0.803)	(3.072)	(11.5)	(1.442)	(4.571)	(7.223)	(0.905)	(3.632)
Observations	211	211	211	191	191	191	211	211	211
R-squared	0.09	0.11	0.02	0.13	0.1	0.01	0.09	0.15	0.03
Source Fixed Effects	No	Yes	No	No	Yes	No	No	Yes	No
Host Fixed Effects	Yes	No	No	Yes	No	No	Yes	No	No
Difference in the Tantrum Effect on Bilateral Lending Outflows from Banks in Source Banking Systems at the 90th versus the 10th Percentile of PruC Index									
	−0.836		−0.596	−2.84		−3.76	4.73		4.85
Difference in the Tantrum Effect on Bilateral Lending Inflows to Borrowers in Host Countries at the 90th versus the 10th Percentile of PruC Index									
		10.89	10.52		17.2	15.37		9.39	9.9

Notes: Table 14 shows the percentage point change in the taper tantrum effect on bilateral lending flows (measured as the change in outstanding bilateral bank claims from before to after the taper tantrum) within the euro area, in response to a one-unit change in the cumulative PruC index. Summary statistics and variable definitions are shown in table 1. Robust standard errors are shown in parentheses below the coefficient estimates; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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