The Cyclicality of Official Bilateral Lending:

Which Cycle Do Flows Follow?

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Abstract[1]

Using a large panel of official bilateral loan data for 111 borrowing countries and 78 lending countries between 1980 and 2020, this paper shows that international government borrowing from bilateral sources is acyclical with respect to the economic cycle of the borrower, but procyclical with respect to the cycle of the lending country. This holds in the case of loans both from advanced economies and from China, currently the largest supplier of official bilateral lending to the average developing country. We find this form of procyclicality most often among middle-income recipient countries across most regions of the world. We also find that bilateral loans follow economic links captured through bilateral trade, and political ties measured by the alignment of votes in the United Nations. The results are consistent across a battery of robustness tests.

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1. Introduction

Official (i.e., government-to-government) lending is a significant source of financing for many countries, particularly developing ones. Most official lending is directed to government counterparties and made up of loans provided by international financial institutions that include multilateral development banks (MDBs)[2] and the International Monetary Fund, and bilateral loans from governments or government-owned institutions.[3] This study focuses on bilateral loans, particularly in their role in smoothing procyclical private capital flows.

As such, the study builds on the literature on the cyclicality of capital flows to emerging economies and also contributes to the smaller body of literature on the behavior of official bilateral flows. There is broad consensus on the procyclicality of capital flows in emerging markets and how such flows can harm economies on the receiving end by being additional sources of volatility in troubling times.[4] This is particularly true for capital flows that come from the private sector.[5] The main argument found in the literature is that when emerging markets are hit by shocks that push them into negative growth territory, private capital flows retract, accelerating and increasing the deleterious effects of the initial shock. By contrast, when economies are booming, capital flows increase and the risk of creating asset price bubbles, among other problems, increases as well.

Not all capital flows are procyclical, however. Evidence also suggests that certain types of capital flows are countercyclical and can partially counteract the procyclical nature of private flows. These countercyclical flows are most often provided as official development assistance through MDBs. Using a panel data set for more than 130 developing countries between 1980 and 2015, Galindo and Panizza (2018) find that MDB lending is countercyclical with respect to the receiving country's gross domestic product (GDP) cycle, and present additional evidence of the high procyclicality of private flows.[6] Their findings are supported by supply and demand considerations. When countries experience economic slowdowns, their governments typically face greater expenditure pressures but tighter financing constraints, leading them to demand more funds

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[2] MDBs include the World Bank, and regional development banks such as the African Development Bank, the Asian Development Bank, the Inter-American Development Bank, and the European Bank for Reconstruction and Development, among many others.

[3] A typical example is a development finance institution in a high-income economy lending resources to the government of a low- or middle-income country to carry out a specific project.

[4] See Kaminsky, Reinhart, and Végh (2004) for a discussion.

[5] See Galindo and Panizza (2018); Alfaro, Kalemli-Ozcan, and Volosovych (2014); and Dasgupta and Ratha (2000) for discussions.

[6] This finding corroborates previous discussions by Levy Yeyati (2009) and Humphrey and Michaelowa (2013).

from MDBs (or other official creditors). On the supply side, MDBs have the mandate to support countries in tight financial situations (see Humphrey and Michaelowa, 2013). When demand meets supply, MDBs can increase their lending at low rates given their *de facto* preferred creditor treatment.[7] In addition, if the economic downturn becomes a crisis, countries can access emergency lending from the IMF, which usually will be accompanied by additional lending from MDBs to support the country in resolving the crisis (Avellán, Galindo, and Lotti, 2021). In this sense, MDB lending acts as an insurance instrument for countries since it allows them to access relatively cheap resources during times of trouble when private sources of funding have dried out. While this key characteristic of MDB lending has been deeply studied, to our knowledge there is no evidence about the cyclicality of official bilateral loans, another type of official lending. This paper helps fill that gap.

Official bilateral lending was the dominant source of external sovereign funding after the Napoleonic wars of the nineteenth century and the World Wars of the twentieth century, and it was key for the recovery of the countries that suffered most during those episodes. It became important particularly during the ensuing economic and financial crises, and before the creation of the IMF and the World Bank in 1944.[8] Since then, and with the more recent creation of multilateral regional development banks, official bilateral loans and MDB loans have coexisted.[9]

Literature has explored why, despite the efficiency gains of lending through MDBs,[10] bilateral lenders have chosen to maintain a direct lending relationship with borrowers.[11] Possible benefits include maintaining full control over the intended outcomes of the resources provided and reducing the risk of surrendering specific elements in the design of operations to the criteria used by the MDBs. Also, acting through an MDB dilutes any specific preferences or objectives a bilateral lender may have, particularly political ones.[12] Regardless of the reasons, to date, bilateral lending accounts for over a third of official lending to developing countries.

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[7] See Cordella and Powell (2021), and Schegl, Trebesch, and Wright (2019) for discussions on the preferred creditor treatment of MDBs.

[8] For a detailed history of official lending over the past two centuries, see Horn, Reinhart, and Trebesch (2020).

[9] The Inter-American Development Bank was created in 1959, the African Development Bank in 1964, the Asian Development Bank in 1966, and the European Bank for Reconstruction and Development in 1991, among others.

[10] Lending through MDBs rather than directly can be cost-effective and more efficient since it exploits the leverage and mobilization capacity of MDBs. When borrowing from an MDB instead of from multiple lenders, countries need to comply with the rules and procedures of only one counterpart rather than many.

[11] For a discussion, see Bobba and Powell (2006).

[12] Bobba and Powell (2006) show that aid from donors to countries that vote the same way in the UN General Council is relatively less effective in supporting development.

The amounts lent and the counterparties chosen have been amply studied. The most common explanation of why a bilateral lender, typically a high-income economy, lends directly to another government is that it wants to support something that is valuable for its own economic and/or political stability. This suggests that lending is not conducted for altruistic motives, but rather to avoid negative spillovers of a political or economic crisis in a country that is economically exposed.[13] In such situations, bilateral loans may be granted to avoid the collateral damage that economic distress or political instability in the receiving country could cause in the lending country. In this context, the more economically and politically exposed a country is to another, the greater its incentive to offer bilateral loans.

Economic exposure has been quantified in various ways by researchers. The measures most often used are bilateral trade relationships and the exposure of the banking system of the lending country to the borrowing one (see Horn, Reinhart and Trebesch, 2020). Greater economic integration is associated with more bilateral lending. Political connections have also been analyzed in the literature as determinants of bilateral lending and bilateral aid. In this context, bilateral loans are provided to countries that are friendly to the political views of the country supplying resources. To proxy this, researchers commonly use the alignment of votes at the United Nations (see Horn, Reinhart and Trebesch, 2020; and Bobba and Powell, 2007). Authors have found that the provision of resources increases as the recipient votes closer to the lending country. Thus, bilateral lending may be viewed as rewarding political alignment. Finally, and in the spirit of gravity models frequently used in the trade literature, geographical and cultural ties are also explanatory factors and are proxied with indicators such as sharing a common language, having colonial links, and sharing a frontier. Again, where any of these ties are stronger, there is more bilateral official lending.[14]

In addition to the above determinants, this paper explores if bilateral lending also acts as insurance when developing economies face downturns. To our knowledge, this question has not been explored in depth. It has been considered to some degree by Horn, Reinhart and Trebesch (2020), who use a novel database of bilateral lending between 1790 and 2015 to explore the determinants of lending during crisis episodes or natural disasters. They use gravity models and

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[13] Discussions motivating this rationale can be found in Gourinchas, Martin, and Messer (2020), Farhi and Tirole (2018), and Tirole (2015).
[14] See Horn, Reinhart and Trebesch (2020) for evidence on this link.

other econometric approaches to show that, during episodes of distress, bilateral lending is higher when there are greater economic and political affinities. The underlying assumption is that when a country is in distress, bilateral lenders will provide funds. The question of our paper is more general: does bilateral lending counteract capital flow cycles? We explore not only extreme episodes as in Horn, Reinhart, and Trebesch (2020), but also what happens at regular upturns and downturns of the cycle. Moreover, we explore if the provision of resources is also affected by the capital flows of the country where resources originate. If a potential lender faces fiscal constraints induced by a recession, it is less likely to offer bilateral loans.

To tackle the question of the cyclicality of official bilateral loans, this paper uses a panel data set of 111 developing countries that received such loans and 78 countries that supplied them between 1980 and 2020. We find that official bilateral debt is procyclical with respect to the economic cycle of the lender and acyclical with respect to the economic cycle of the borrower. Where the flows originate matters. Our estimates suggest that flows from China are procyclical when China experiences a contraction, while those from high-income or "advanced" economies are procyclical when those countries experience an expansion. Regardless of the origin, our main result is replicated when the recipient is a middle-income country. That is, in middle-income countries, official bilateral flows are acyclical with respect to the recipient's cycle and procyclical with respect to the origin's cycle. For low-income countries, we find evidence of procyclicality in the recipient's cycle when the flows originate in China, but no evidence of procyclicality in China's own cycle. By contrast, if the origin is an advanced economy, we see evidence of procyclicality in the lender's cycle. These results are stronger in middle-income countries than in lower-income ones and hold in most recipient regions of the world. They are also robust to changes in the specification, the inclusion of additional controls, and alternative measures of the economic cycle.

In summary our results suggest that, in contrast to official flows supplied by multilateral development banks that tend to be countercyclical or acyclical, and hence work as an insurance mechanism when private capital flows retrench, bilateral loans do not offer this benefit, but on the contrary could bring an additional source of volatility linked to the economic cycle of the lender. These results highlight the importance of diversifying the pool of bilateral lenders, so that borrowers can mitigate volatility while reaping associated benefits.

The rest of the paper is organized as follows. Section 2 describes the main trends in the data used in the paper and shows the evolution of bilateral lending compared to other sources of official and private sector sovereign lending during the four decades of our analysis. Section 3 describes the empirical methodology used, inspired by the gravity models used in the trade literature. Section 4 reports our baseline results. In Sections 5 and 6, we report alternative estimations that address sources of heterogeneity (Section 5) and conduct a battery of robustness exercises (Section 6). Section 7 concludes.

2. Trends in Official Bilateral Lending

Official debt represents a significant share of the sovereign external debt of emerging and developing economies. At the end of 2020, around 70 percent of sovereign external debt in the average emerging and developing country (Figure 1, Panel A), equivalent to more than 20 percent of GDP (Figure 1, Panel B), was supplied by the official sector.[15] Multilateral debt represented the largest share of official debt, at nearly 60 percent, and bilateral debt the remaining 40 percent.

Figure 1. Disaggregation of Total Public External Debt by Type, 1980–2020
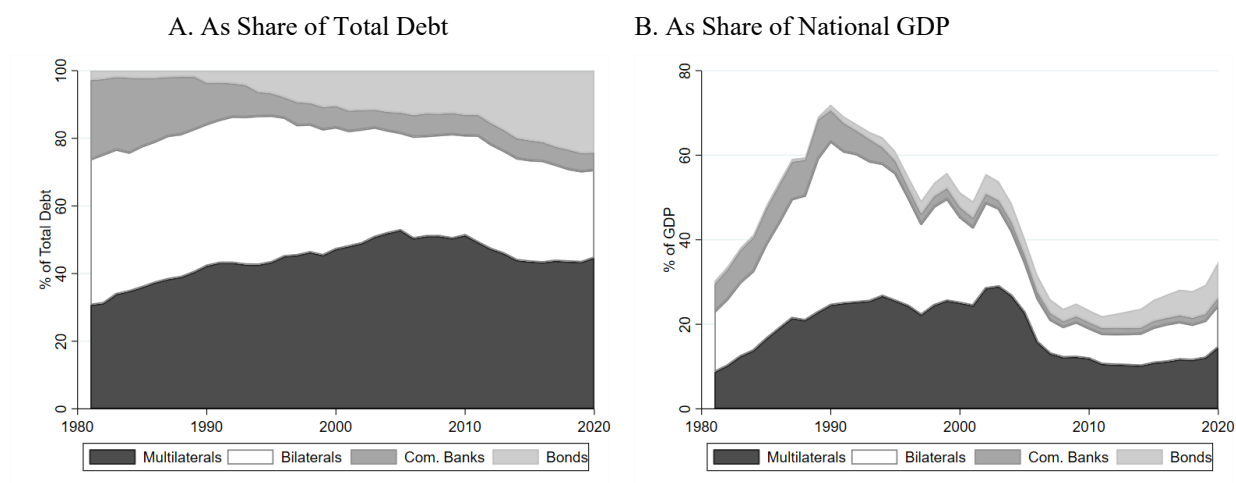
Source: Authors' compilation based on the International Debt Statistics (IDS) of the World Bank. Figures reported are averages across the sample of developing and emerging economies listed in Appendix A.

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[15] The countries included in the sample are reported in Appendix A.

The dynamics of external debt, including official debt, in emerging and developing economies have varied significantly over time. Until the late 1990s, bilateral and multilateral debt followed similar paths. Both types of debt accounted for roughly the same share, though bilateral loans were slightly more prominent at the beginning of the 1990s, when they reached nearly 20 percent of GDP in the average receiving country. In the 2000s, multilateral debt increased its share of official debt, and the share of bilateral debt shrunk as bonded debt increased. During most of the first decade of the twenty-first century, emerging and developing market governments went through a process of deleveraging their public external debt. Between 2000 and 2008, a period of high growth boosted by favorable global conditions, the ratio of external debt to regional GDP fell nearly 20 percentage points. The global financial crisis interrupted this trend in 2008–09, and all debt supplied by all sources grew again. The trend was exacerbated by the COVID-19 pandemic.[16]

Figure 2 plots the evolution of official bilateral sovereign debt in the same sample of receiving countries. The figure classifies them in three categories: advanced economies, China, and others (see Appendix B for details). Both advanced economies and China are highlighted, given the historical importance of the first group, and China's growing relevance in providing finance for development over the past two decades.[17]

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[16] Appendix C shows how these patterns have evolved in different regions of the world and reveals that, while there are some differences, the trends have been similar across the globe.

[17] As noted by Horn, Reinhart, and Trebesch (2021), reported figures of bilateral loans may be underestimated in several countries, particularly in the past 20 years. The World Bank's IDS, a common reference for these figures, defines official bilateral loans as: "loans from governments and their agencies (including central banks), loans from autonomous bodies, and direct loans from official export credit agencies." In practice, several types of loans do not match this classification, which may lead to an underestimation of bilateral loans. A notable example are the loans from China to the developing world; the reported data include only a subset of loans from a few institutions. A detailed discussion of Chinese sovereign lending is found in Horn, Reinhart, and Trebesch (2021).

Figure 2. Disaggregation of Total Bilateral Public Debt by Origin, 1980–2020
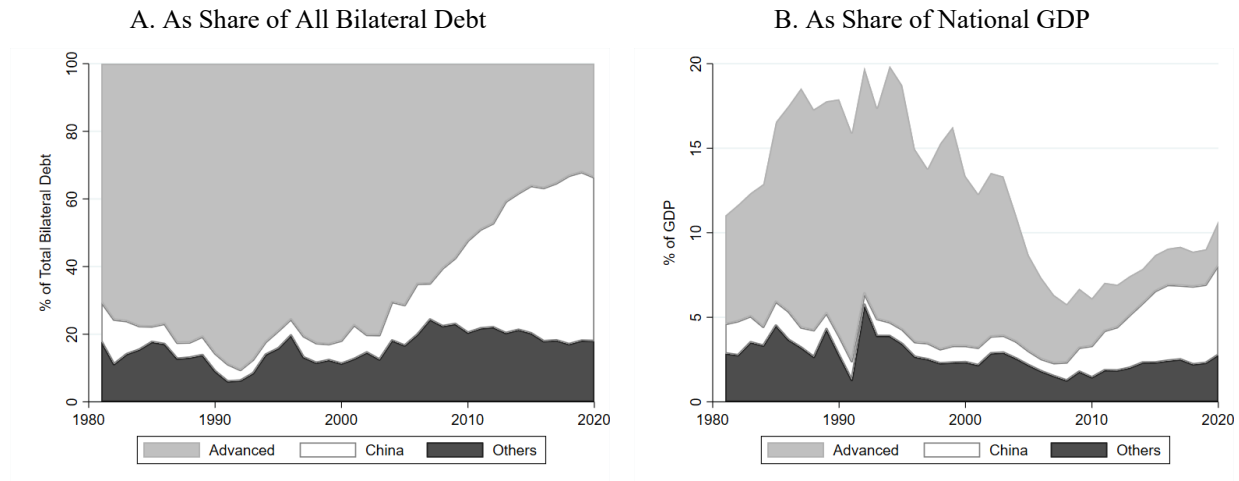
A. As Share of All Bilateral Debt

B. As Share of National GDP

Source: Authors' compilation based on the IDS of the World Bank. Figures reported are averages across the sample of developing and emerging economies listed in Appendix A.

Several features stand out in Figure 2. First is the rising role of China as a development partner of emerging and developing countries, particularly since the middle of the first decade of the twenty-first century. In the average country, in 2020, Chinese debt represented a greater share than that originating in the advanced economies that were once the main bilateral lenders. Second is the significant decline of bilateral debt between the end of the twentieth century and 2020. At the end of 2020, bilateral debt reached 10 percent of GDP in the average borrowing country compared to close to 20 percent in the 1990s. But looking more closely, one can see that bilateral debt started to increase again around 2010, mostly driven by debt of Chinese origin. As reported in Appendix C, Figure C.2, the composition of bilateral debt varies notably across regions of the world. While China's rise as a lender can be seen across most emerging and developing economies, it is greatest in East Asian and Pacific countries, and in Europe and Central Asia.[18]

To complete the picture of bilateral debt, Figure 3 maps the origin and recipient countries considered in this study. Panel A plots the origin countries and indicates if they are advanced economies or not, and Panel B plots the recipient ones and indicates the average weight of bilateral debt in GDP between 1980 and 2020. While advanced economies and China have supplied the largest shares of official bilateral debt, many countries around the globe, including developing and

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[18] Part of the increase reflects the Belt and Road Initiative unveiled by the Chinese government in 2013, a global infrastructure development strategy that involved many countries, mostly in Pacific Asia, Africa, and Central and Eastern Europe.

emerging ones, also supply a considerable portion (around 15 percent). Panel B shows that the top recipients of bilateral debt are the poorest countries of the world, mostly in Sub-Saharan Africa and South Asia.

Figure 3. Sample Origin and Recipient Countries

A. Origin Countries   B. Recipient Countries by Average Bilateral Debt Outstanding (% of GDP)
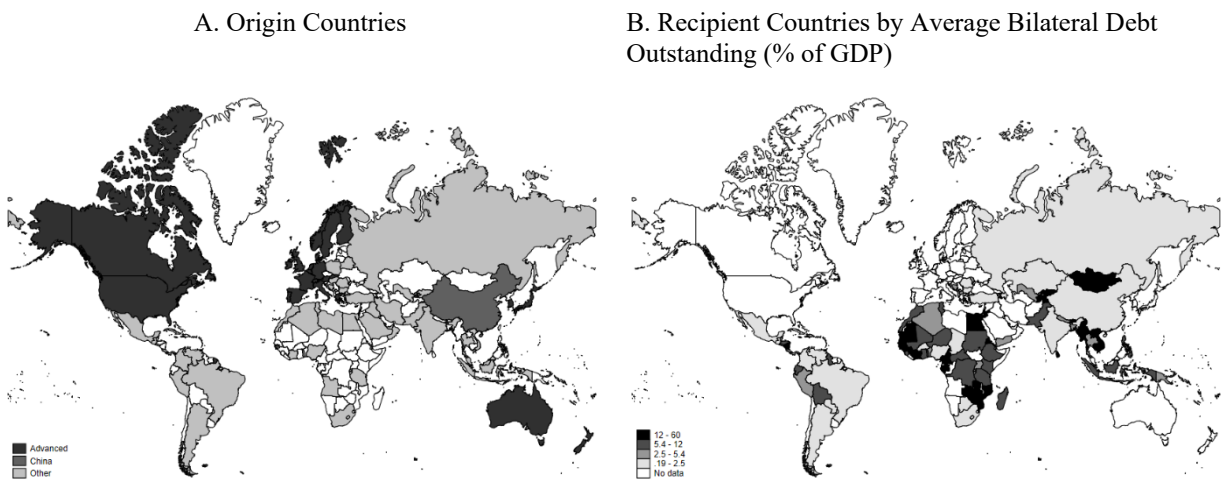
Source: Authors' compilation based on the IDS of the World Bank. Panel B reports averages between 1980 and 2020.

3. Empirical Strategy and Data

The main empirical question this paper asks is if official bilateral loans are countercyclical or not. Specifically, do they have the ability to counteract the procyclical nature of private capital flows? This question, which has been addressed for other types of official flows,[19] takes on a particular nuance in the context of bilateral flows, which can also respond to the business cycle of the originating country. Regardless of the needs of the borrowing country, economic conditions in the lending country might limit the countercyclical role of bilateral flows. If economic conditions are tight in a country that supplies bilateral lending, it might not be able to lend to a developing partner to counter a reduction in private capital flows. Thus, the insurance benefit of official lending could be limited, as it is not necessarily timed with the economic downturns of potential borrowers.

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[19] See Galindo and Panizza (2018) and others.

To test how bilateral lending responds to the business cycles of both borrowing and the lending countries, we employ Poisson Pseudo Maximum Likelihood (PPML) methods and estimate a model inspired by gravity equations. Gravity models, in their log-linearized form, are typical of trade literature and have been used to assess the determinants of bilateral trade. Since least-squares regressions of these log-linearized gravity models are not feasible given the amount of zero values in the dependent variable (leading to a truncated sample) and produce inconsistent parameter estimates under heteroskedasticity,[20] the trade literature has turned to PPML estimators as initially proposed by Santos Silva and Tenreyro (2006). PPML deals adequately with heteroskedasticity and the zero values in the dependent variable that often occur in trade flows that are not a result of an observability problem but correspond to so-called corner solutions (Santos Silva, Tenreyro and Windmeijer, 2015). In the presence of non-negative data with a mass-point at zero, PPML seems to be the best estimator if one wants to make minimal assumptions about the distribution of the data (Correia, Guimarãaes, and Zylkin, 2019).

In examining the relationship between bilateral flows and the economic cycle of recipient countries, we follow the spirit of established gravity trade models and express gross bilateral flows as a function of financial and political connections between countries. We estimate:

$$bilateral_{i,j,t} = \alpha + \beta cycle_{j,t-1} + \gamma cycle_{i,t-1} + \delta X_{i,j,t} + \eta_{i,j} + \vartheta_t + \varepsilon_{i,j,t} \qquad (1)$$

where $bilateral_{i,j,t}$ are bilateral disbursements from country i to recipient country j in year t, as a percentage of trend GDP of the recipient country; $cycle_{j,t-1}$ is the economic cycle of recipient country j in year t-1, while $cycle_{i,t-1}$ is the economic cycle of origin country i in the previous year.[21] $X_{i,j,t}$ are a series of controls at the country-pair/year level that include total trade between country j and i normalized by the trend GDP of the recipient country, to capture the commercial ties of the country pair following Horn, Reinhart and Trebesch (2020), and the UN voting agreement score, to capture political proximity as in Horn, Reinhart and Trebesch (2020) and Bobba and Powell (2007), among others. All the variables are in logs.

Anderson and Wincoop (2003) argue that the traditional gravity equations were incorrectly specified since they did not account for multilateral resistance terms. Hence, they add importer and exporter fixed effects and estimate an augmented gravity equation. We go a step further and

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[20] See Santos Silva and Tenreyro (2022) for a discussion.
[21] We use lags of the GDP cycle to minimize potential endogeneity issues.

control for country-pair fixed effects, $\eta_{i,j}$, that capture all the time-invariant unobservable characteristics at the country-pair level; ϑ_t are year fixed effects, also included to control for all global shocks; $\varepsilon_{i,j,t}$ are standard errors clustered at the country-pair level.

Given the relative importance of advanced economies and China in providing bilateral loans, throughout the various empirical exercises reported in the paper, we report results for the whole sample of origin countries and for these two origins separately. This allows for relevant comparisons between these two groups of dominant lenders.

To estimate equation (1), we compile information from several sources. Our starting point for measures of bilateral lending is the IDS of the World Bank. We use bilateral disbursements (i.e., drawings by the borrower on loan commitments)[22] in current US dollars, normalized by the GDP trend of the recipient country.[23] We normalize by trend GDP to avoid potential endogeneity of GDP to debt flows.

Our key independent variables are the cyclical components of the GDP of the recipient and origin countries of the bilateral flows described above. In our baseline specification, we estimate these components using the Hodrick-Prescott filter on the logarithm of real GDP, based on the World Development Indicators of the World Bank.

The measure of the trade integration of each pair of countries is the sum of the bilateral exports and imports between them. The IMF's Direction of Trade Statistics provide the value of merchandise exports and imports between country pairs. Imports are reported on a cost, insurance, and freight basis, while exports are reported on a free on-board basis. By adding both, we get the total trade of each country pair. We also normalize bilateral trade by the nominal GDP trend of the recipient country.

To compute political proximity, we use the agreement score calculated by Bailey, Strezhnev, and Voeten (2017) based on their United Nations General Assembly voting data. This variable is a voting similarity index between two countries in each session. It is computed using three categories for each voting session (1= "yes" or approval of an issue; 2= abstain; 3= "no" or disapproval of an issue). Finally, the agreement score is defined as 1 minus the average distance

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[22] Including loans from governments and their agencies (including central banks), loans from autonomous bodies, and direct loans from official export credit agencies.

[23] The annual data on GDP in current US dollars for the recipient and origin countries are taken from the World Bank World Development Indicators. In our baseline specifications, we compute the cyclical component and trend of the logarithmic of GDP using a Hodrick-Prescott filter with a smoothing parameter of 100 for annual data.

between two countries at a determined time. A score equal to 1 indicates that two countries agree on all votes, while -1 indicates that two countries maximally disagree on all resolutions.

Once all the data are merged, we have an unbalanced panel of 1,396 country pairs between 1981 and 2020. There are 111 recipient countries classified as non-advanced (according to the IMF definition) and 78 countries of origin.

As robustness exercises, we also control for measures of total indebtedness of the recipient country; for this, we consider total external sovereign indebtedness, total multilateral debt, and total bilateral debt. The source of these data is the same as that of the dependent variable of our study: the IDS of the World Bank.

Table 1 reports the key descriptive statistics of the main variables used throughout the empirical analysis.

Table 1. Summary Statistics

	Obs.	Mean	SD	Min	p25	Median	p75	Max
Pair statistics								
Origin: All								
Bilateral disbursements (% trend GDP)	27,850	0.12	0.53	0.00	0.00	0.00	0.05	23.40
Log(Pair total trade [% trend GDP])	27,850	-0.18	1.80	-11.13	-1.08	-0.05	0.94	4.94
Log(Pair UN votes agreement score)	27,850	-0.35	0.30	-2.21	-0.44	-0.31	-0.14	0.00
Origin: Advanced								
Bilateral disbursements (% trend GDP)	19,554	0.10	0.34	0.00	0.00	0.00	0.04	12.63
Log(Pair total trade [% trend GDP])	19,554	-0.03	1.53	-7.08	-0.92	-0.03	0.92	4.37
Log(Pair UN votes agreement score)	19,554	-0.45	0.31	-2.21	-0.49	-0.37	-0.29	0.00
Origin: China								
Bilateral disbursements (% trend GDP)	1,979	0.37	0.87	0.00	0.00	0.04	0.32	10.82
Log(Pair total trade [% trend GDP])	1,979	0.79	1.30	-5.36	0.02	0.97	1.61	4.34
Log(Pair UN votes agreement score)	1,979	-0.13	0.09	-0.69	-0.17	-0.11	-0.07	0.00
Recipient country statistics								
Recipient's cycle	3,752	0.00	0.05	-0.54	-0.02	0.00	0.02	0.23
Recipient's expansions	3,752	0.01	0.03	0.00	0.00	0.00	0.02	0.23
Recipient's contractions	3,752	-0.02	0.03	-0.54	-0.02	0.00	0.00	0.00
Log(Total bilateral debt [% trend GDP])	3,752	2.05	1.38	-5.54	1.33	2.17	2.95	5.54
Log(Total multilateral debt [% trend GDP])	3,747	2.37	1.21	-7.78	1.84	2.53	3.11	5.41
Log(Total external public debt [% trend GDP])	3,752	3.44	0.83	-0.74	2.94	3.46	3.98	6.09
Origin statistics								
Origin's cycle (all)	1943	0.00	0.05	-0.65	-0.02	0.00	0.02	0.50
Origin's cycle (advanced)	824	0.00	0.02	-0.09	-0.01	0.00	0.01	0.10
Origin's cycle (China)								
	40	0.00	0.03	-0.07	-0.03	0.00	0.02	0.05

4. Baseline Results

Table 2 reports the baseline results of estimating equation (1) with different structures of fixed effects, controls, and different origins. In column (1), recipient country fixed effects, origin country fixed effects, and year fixed effects are included, to control for global factors that vary in time, and for unobserved invariant characteristics of the recipient and origin countries separately. Bilateral flows do not exhibit a significant relationship with the economic cycle of the recipient country, pointing toward the acyclicality of official bilateral flows. Bilateral flows seem instead to be procyclical with respect to the origin country's economic cycle, indicating that when a country is experiencing a positive (negative) cycle, its flows toward emerging economies increase (decrease). These results hold when separate recipient-country and origin-country fixed effects are substituted with country-pair fixed effects (column [2]).

In column (3), we add controls at the country-pair level that vary in time: total trade between country j and i normalized by trend GDP of the recipient country and the UN voting agreement score, to capture commercial and political proximity. The main result regarding the procyclicality of bilateral flows with respect to the country of origin remains. In addition, we find that bilateral flows are also positively and significantly correlated with total trade between the two countries, indicating that they become larger as trade links become stronger. We do not find a statistically significant relationship between bilateral flows and political affinity, as measured by the UN votes agreement score.

In columns (4) and (5), we then explore country heterogeneities by focusing our attention on origin countries that are advanced economies (column [4]) and on China (column [5]). In the case of flows originated in advanced economies, the results mirror those of column (3). Bilateral flows are acyclical with respect to the recipient's business cycle and procyclical with respect to the origin's. Bilateral flows are significantly correlated with trade flows. In the case of advanced economies, political ties are statistically significant; official bilateral lending flows increase as countries' votes at the UN General Assembly align. These results are not only statistically significant but they are also economically relevant. A rise in one standard deviation in the cycle of the origin country increases official bilateral debt flows by 0.06 percentage points, nearly 20 percent of a standard deviation of bilateral flows for this sample (0.34). A one standard deviation increase in bilateral trade between advanced countries and recipients of bilateral debt flows increases debt flows by nearly 0.6 percentage points (almost two times a standard deviation).

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Similarly, a one standard deviation rise in the proximity of votes increases bilateral debt flows by 0.2 percentage points.

In the case of flows originating in China (column [5]), the specification is slightly different. In this specification, we drop the time fixed effects since they would fully correlate with the origin cycle variable. We find that bilateral debt flows are acyclical with respect to the recipient's cycle, but more strongly correlated to China's own cycle.[24] A one standard deviation increase in China's business cycle increases debt flows by 0.38 percentage points (over 40 percent of a standard deviation). Trade integration remains significant, both statistically as well as economically. A one standard deviation increase in the trade variable for this sample increases bilateral debt flows by 0.6 percentage points, around two-thirds of a standard deviation of bilateral debt flows in the same sample. We find no significant relationship between bilateral debt flows and the alignment of votes at the UN.

Table 2. Baseline Regressions

	(1)	(2)	(3)	(4)	(5)
	Origin: All	Origin: All	Origin: All	Origin: Adv.	Origin: China
Recipient's cycle (t-1)	-0.424	0.277	-0.075	-0.598	1.523
	(0.509)	(0.505)	(0.504)	(0.583)	(0.980)
Origin's cycle (t-1)	3.109***	2.734***	2.317**	2.937*	12.535***
	(0.948)	(0.994)	(0.988)	(1.776)	(3.115)
Log(Pair total trade [% trend GDP])			0.505***	0.385***	0.463***
			(0.063)	(0.072)	(0.080)
Log(Pair UN votes agreement score)			0.334	0.564**	-0.571
			(0.220)	(0.229)	(0.688)
Constant	-1.199***	0.818***	1.368***	1.337***	-1.182***
	(0.049)	(0.004)	(0.106)	(0.133)	(0.174)
Number of observations	27,850	27,850	27,850	19,554	1,979
Number of pairs	1,396	1,396	1,396	867	95
Pseudo-R-squared	0.28	0.40	0.41	0.37	0.32
Log likelihood	-8025.32	-6733.72	-6565.21	-3946.59	-1136.27
Fixed effects	Recipient, origin & time	Pair & time	Pair & time	Pair & time	Pair

Note: This table presents a set of PPML regressions where the dependent variable is bilateral disbursements as a percentage of the recipient's GDP trend. The cycles are computed as the percent deviation between GDP and trend GDP, where the trend is computed with the Hodrick-Prescott filter. Clustered standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

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[24] Given the large estimated coefficient indicating the procyclicality of Chinese bilateral flows with respect to the origin cycle, we also estimate equation (2) where we add an interaction between the origin economic cycle and a dummy with a unit value when the origin country is an advanced economy, or when it is China. When testing whether procyclicality with respect to the origin cycle differs between the two options, we find no significant difference.

Table 3 differentiates between episodes of expansion and contraction, defined as the output gap being above or below trend, respectively. Each of the cycle variables (recipient and origin) ise broken into two variables: one capturing expansions, the other capturing contractions. The expansion (contraction) variable takes the value of the cycle variable when the cycle is positive (negative) and zero otherwise. Each column reports results for different origin groups: Column (1) for the whole sample, column (2) for advanced economies, and column (3) for China.

Table 3. Expansions and Contractions

	(1)	(2)	(3)
	Origin: All	Origin: Advanced	Origin: China
Recipient's expansions (t-1)	-0.049	-0.295	0.981
	(1.188)	(0.949)	(2.104)
Recipient's contractions (t-1)	-0.098	-0.875	1.711
	(1.219)	(1.084)	(2.305)
Origin's expansions (t-1)	1.981	8.919**	4.852
	(1.795)	(3.542)	(4.723)
Origin's contractions (t-1)	2.716	-2.164	23.166***
	(1.924)	(4.350)	(8.560)
Log(Pair total trade [% trend GDP])	0.505***	0.386***	0.422***
	(0.063)	(0.072)	(0.074)
Log(Pair UN votes agreement score)	0.338	0.565**	0.033
	(0.216)	(0.229)	(0.760)
Constant	-1.360***	-1.437***	-0.886***
	(0.114)	(0.129)	(0.192)
Number of observations	27,850	19,554	1,979
Number of pairs	1,396	867	95
Pseudo-R-squared	0.41	0.37	0.32
Log likelihood	-6565.16	-3944.63	-1133.60

Note: This table presents a set of PPML regressions where the dependent variable is bilateral disbursements as a percentage of the recipient's GDP trend. The cycles are computed as the percent deviation between GDP and trend GDP, where the trend is computed with the Hodrick-Prescott filter. "Expansions" refer to the positive components of those cycles while "Contractions" refer to the negatives. Regressions with all and advanced economy origins include pair and time fixed effects, while those with the origin of China include only pair effects. Clustered standard errors in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

When considering the whole sample and separating the cycle into expansions and contractions in column (1), we lose the significance of the origin cycle variable reported in Table 2. However, when focusing on the two origin categories (i.e., advanced economy or China) in

columns (2) and (3), the significance of the origin cycle is maintained but the source of this significance varies. Column (2) suggests that the procyclicality of the origin cycle is more notable during expansions in advanced economies, suggesting that the more these economies grow, the greater the volume of official bilateral loans supplied. During contractions, however, flows do not fall. The opposite happens with flows of Chinese origin. During contractions in China, flows supplied by China to emerging and developing countries fall significantly, but when China grows above trend, its supply of bilateral loans does not increase proportionally. While in both cases, the volatility of the economic cycle in the origin countries can be transmitted to the recipient through bilateral lending, how it does so will vary, depending on the origin country and where it is in its own business cycle.

5. Heterogeneity

We explore two relevant sources of heterogeneity among recipient countries. First, by income levels and, second, by geographical regions of the world. For the first exercise, we estimate equation (1) for different subsamples defined by the income level of the recipient country, according to the World Bank's income classification.[25] In order to simplify the presentation of the results in Figure 4 we report the coefficients estimated and their 90 percent confidence intervals for each of the estimated subsamples.[26] As above, we also estimate each equation for the whole sample of origin countries (Panel A), for advanced economy origin (Panel B), and for Chinese origin (Panel C).

As can be seen in Panel A, the procyclicality of bilateral flows with respect to the origin cycle occurs when recipients are middle-income countries, whereas in low-income countries acyclicality seems to prevail. When bilateral flows originate from advanced economies, they still seem to be procyclical with respect to their own cycle when financing both low- and middle-income recipient countries, and acyclical with respect to the recipient economic conditions (Panel B).

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[25] Appendix D, Table D.1, shows the World Bank's income classification of each recipient country in 2020.
[26] Complete regression results are reported in Appendix C.

Figure 4. By Recipient Income Level

(a) Origin: All

(b) Origin: Advanced

(c) Origin: China
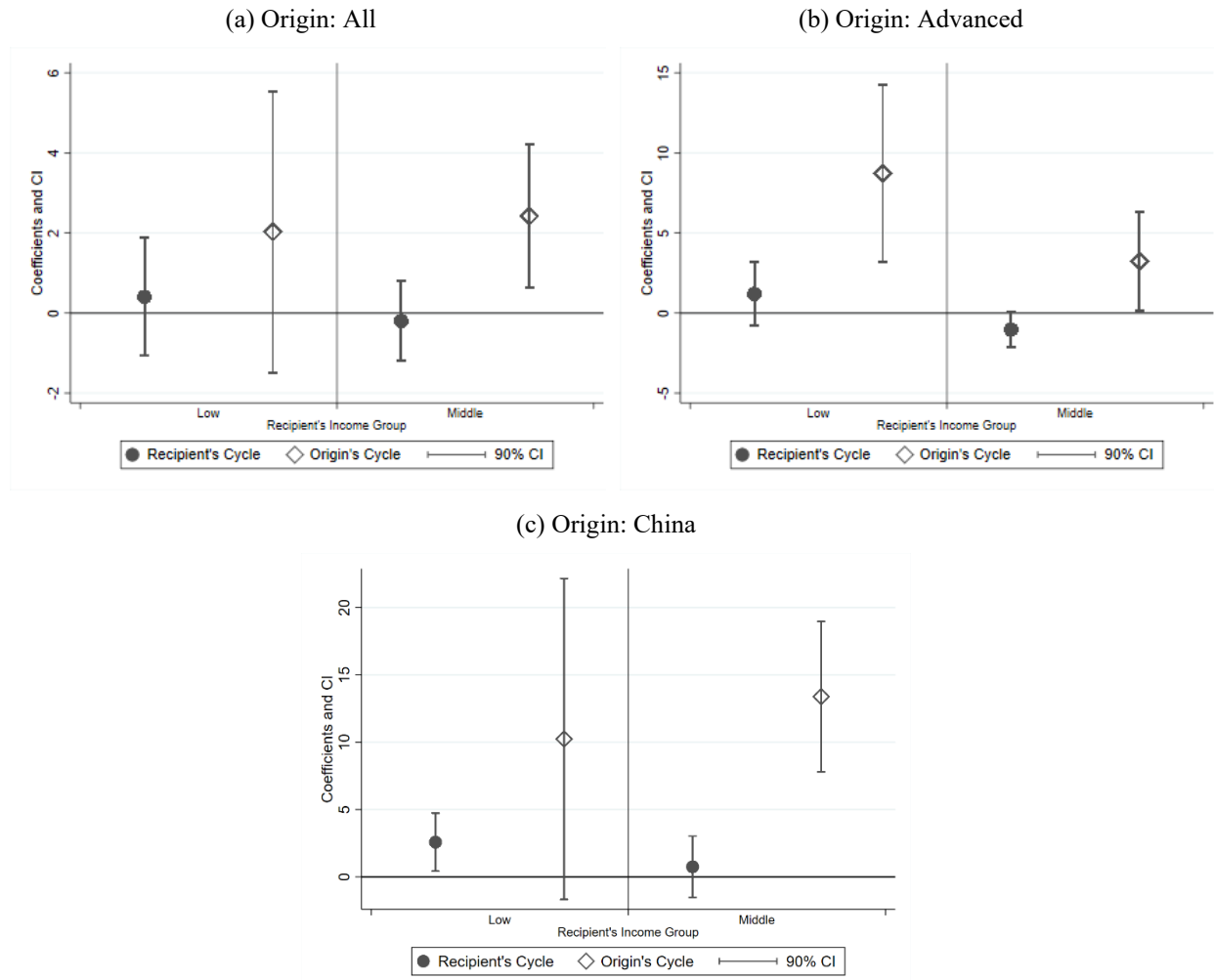
Note: These plots show the recipient and origin countries' cycle coefficients from a set of PPML regressions detailed in Table D.1, Appendix D. The dependent variable is bilateral disbursements as a percentage of the recipient's GDP trend. The cycles are computed as the percent deviation between GDP and trend GDP, where the trend is calculated with the Hodrick-Prescott filter. The recipient's income group is according to the World Bank classification. The lines represent the 90 percent confidence intervals estimated from clustered standard errors. Regressions of Panels A and B include pair and time fixed effects, while those of Panel C include only pair effects.

In Panel C, we observe that Chinese bilateral flows are procyclical with respect to China's own cycle only when directed toward middle-income countries, but they are procyclical with respect to the economic cycle of recipient countries when these are low income. Given the recent increase in the relevance of Chinese flows for emerging and developing countries, the behavior of Chinese flows might pose a further threat precisely to the most vulnerable low-income countries, since when the latter are expanding, they will receive more flows from China, but when they are

experiencing economic downturns, they will confront capital reversals and more limited access to financing, at least as far as Chinese flows are concerned.

For a deeper dive into country heterogeneities, we consider whether the patterns previously identified align with geographical regions. To do this, we estimate a modified version of equation (1) that includes interaction terms between the economic cycles of origin and recipient countries and dummy variables with a unit value when bilateral flows originate from different regions. Namely, we estimate:

$$bilateral_{i,j,t} = \alpha + \beta cycle_{j,t-1} + \gamma cycle_{i,t-1} + \lambda cycle_{j,t-1} * advanced\ origin_i + \mu cycle_{i,t-1} * advanced\ origin_i + \delta cycle_{j,t-1} * China\ origin_i + \theta cycle_{i,t-1} * China\ origin_i + \delta X_{i,j,t} + \eta_{i,j} + \vartheta_t + \varepsilon_{i,j,t} \quad (2)$$

where $advanced\ origin_i$ is an indicator variable equal to 1 when the country i from which flows originate is an advanced economy, and $China\ origin_i$ is the equivalent when the origin country is China. Thus, $\beta + \lambda$ and $\gamma + \mu$ will capture the cyclicality of advanced economies' bilateral flows with respect to the recipient country's and the origin country's cycle, respectively, and $\beta + \delta$ and $\gamma + \theta$ will capture the cyclicality of bilateral flows with Chinese origin. As above, to simplify the presentation of the results, we report them graphically in Figure 5, focusing on these relevant parameters. Panel A reports the coefficient in equation (2) associated with the recipient's cycle for each subregion of the world and each set of origin countries, and Panel B shows the results for the coefficient associated with the origin country's cycle.

In the case of flows from advanced countries, Panel A of Figure 5 suggests that the result of acyclicality with respect to the recipient's cycle is confirmed in all regions. In the case of bilateral loans from China, the evidence is mixed and there is evidence of procyclicality with respect to the recipient's cycle in Europe and Central Asia, South Asia, and Sub-Saharan Africa.

Figure 5. By Geographical Region

A. Recipient's Cycle
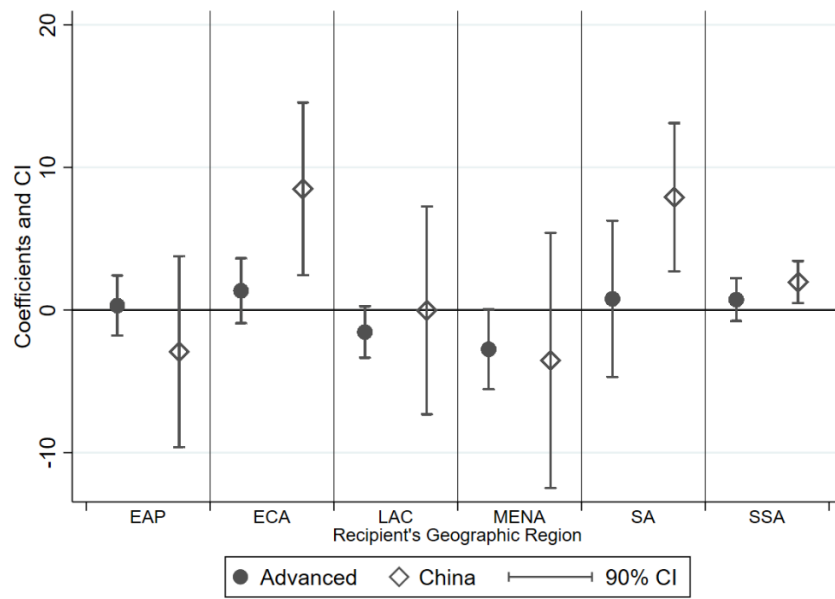
B. Origin Country's Cycle
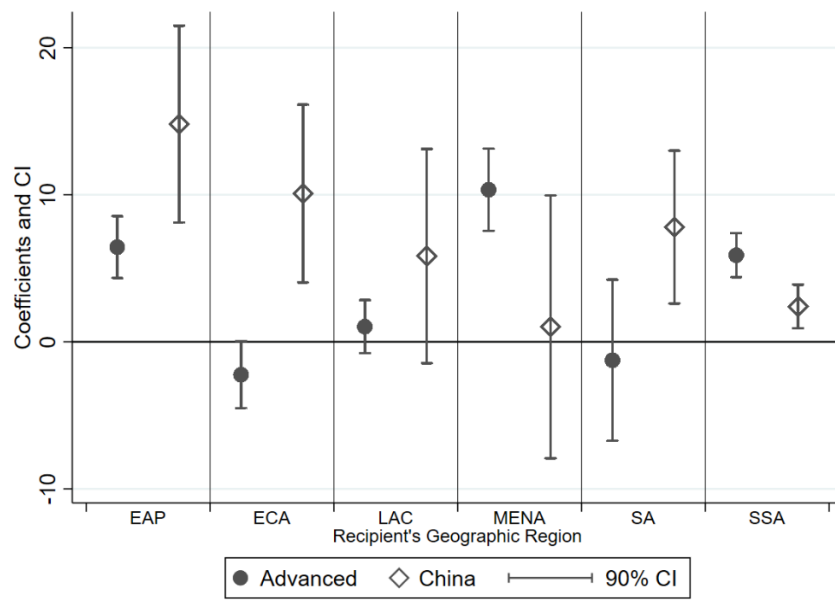
Note: These plots show the overall recipient and origin's cycle joint coefficients from a set of PPML regression following equation (2) and reported in Table D.2, Appendix D. The dependent variable is bilateral disbursements as a percentage of the recipient's GDP trend. The cycles are computed as the percent deviation between GDP and trend GDP, where the trend is calculated with the Hodrick-Prescott filter. The recipient's geographical group is according to the World Bank's classification: East Asia and Pacific (EAP), Europe and Central Asia (ECA), Latin America and the Caribbean (LAC), Middle East and North Africa (MENA), South Asia (SA), and Sub-Saharan Africa (SSA). The lines represent the 90 percent confidence intervals estimated from clustered standard errors. All regressions include pair and time fixed effects.

With respect to the cycle of the origin country, Panel B of Figure 5 shows that procyclicality dominates the picture. When considering advanced economy origins, we estimate procyclicality for recipients in East Asia and Pacific, the Middle East and North Africa, and Sub-Saharan Africa. In the case of flows originating in China, we find evidence of procyclicality in all cases except Latin America and the Caribbean and the Middle East and North Africa.

In sum, flows tend to be acyclical with respect to the recipient country, except for bilateral flows from China toward Europe and Central Asia, South Asia, and Sub-Saharan Africa. In the cases of East Asia and Pacific and Sub-Saharan Africa, flows are always procyclical regardless of their origin, and, in the case of Latin America and the Caribbean, acyclical. In other regions of the world, the evidence is mixed, but some degree of procyclicality is consistently present.

6. Robustness Checks

We perform three sets of robustness sets. First, we control for potential omitted variable bias and include additional regressors in our baseline estimations. Second, we use alternative methodologies in the estimation of the business cycles, the key feature in our research. Finally, we replace the country-pair fixed effects with time-invariant country-pair regressors frequently used in the trade literature.

6.1 Omitted Variables

Our results could suffer from omitted variable bias. The fixed effects in our estimated equations control for global shocks that affect all countries and for everything that is invariant in time but constant at the country-pair level. Hence, if there was an omitted variable correlated with both our dependent variables and our independent variables of interest that varied in time at the country level, our estimated coefficients would be biased.

To mitigate this concern, we test whether our baseline results hold to the introduction of other controls that vary at the country/year level in Table 4. We test if results are robust when controlling for the lagged values of accumulated stock of bilateral debt, multilateral debt, and the total external debt stock, public and publicly guaranteed, as the debt of the recipient country might influence the decision of other countries to finance or not.[27] All of these variables are normalized

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[27] We extract these variables from the IDS. Public and publicly guaranteed debt comprises long-term external obligations of public debtors, including national governments, public corporations, state-owned enterprises,

by the trend GDP of the recipient country and expressed in logs. As shown in columns (1)–(3), results are not affected by these controls as bilateral flows are still procyclical with respect to the origin cycle and acyclical with respect to the recipient country. Interestingly, for the complete sample of countries of origin, the debt stocks are not statistically significant.

Table 4. Controlling for Debt Stocks

	(1)	(2)	(3)
	Debt: Bilateral	Debt: MDB	Debt: Total External
Recipient's cycle (t-1)	-0.255	-0.285	-0.267
	(0.513)	(0.517)	(0.510)
Origin's cycle (t-1)	2.006**	2.109**	2.003**
	(0.953)	(0.978)	(0.956)
Log(Pair total trade [% trend GDP])	0.481***	0.487***	0.483***
	(0.060)	(0.060)	(0.059)
Log(Pair UN votes agreement score)	0.289	0.290	0.305
	(0.215)	(0.207)	(0.209)
Log(Debt stock [% trend GDP]) (t-1)	0.035	0.048	-0.000
	(0.074)	(0.063)	(0.089)
Constant	-1.457***	-1.500***	-1.355***
	(0.221)	(0.168)	(0.318)
Number of observations	27,832	27,786	27,835
Number of pairs	1,396	1,393	1,396
Pseudo-R-squared	0.41	0.41	0.41
Log likelihood	-6533.75	-6497.09	-6534.96

Note: This table presents a set of PPML regressions where the dependent variable is bilateral disbursements as a percentage of the GDP trend. The cycles are computed as the percent deviation between GDP and trend GDP, where the trend is computed with the Hodrick-Prescott filter. The debt variable changes from one column to another, as is indicated in each column title. All regressions include pair and time fixed effects. Clustered standard errors in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

In Table 5, we report the same exercises, but we split the samples between loans originating in advanced economies and those originating in China. The main baseline results regarding cyclicality hold. Results hold also for bilateral flows originating from advanced economies (columns [1]–[3]) and China (columns [4]–[6]). As opposed to the results in Table 4, here we find that the official bilateral flows are correlated with the initial stock of different types of debt that

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development banks and other mixed enterprises, political subdivisions, autonomous public bodies, and external obligations of private debtors that are guaranteed for repayment by a public entity.

the recipient country holds. In the case of advanced economies, the sign is positive and significant across specifications, suggesting a possible complementarity between alternative sources of lending, including bilateral lending. In the case of debt with Chinese origin, the sign is consistently negative, indicating, possibly, some substitution between debt of this origin and other sources of sovereign debt.

Table 5. Controlling for Debt Stocks by Origin

	(1)	(2)	(3)	(4)	(5)	(6)
	Origin: Advanced			Origin: China		
	Debt: Bilateral	Debt: MDB	Debt: Total External	Debt: Bilateral	Debt: MDB	Debt: Total External
Recipient's cycle (t-1)	-0.517	-0.663	-0.593	1.155	1.113	1.274
	(0.587)	(0.575)	(0.581)	(1.084)	(0.958)	(1.059)
Origin's cycle (t-1)	3.072*	3.197*	2.974*	11.471***	10.980***	9.827***
	(1.768)	(1.772)	(1.791)	(3.332)	(3.164)	(3.326)
Log(Pair total trade [% trend GDP])	0.389***	0.360***	0.379***	0.419***	0.394***	0.365***
	(0.072)	(0.073)	(0.074)	(0.085)	(0.085)	(0.093)
Log(Pair UN votes agreement score)	0.553**	0.508**	0.559**	-0.621	0.179	-0.324
	(0.225)	(0.220)	(0.226)	(0.666)	(0.722)	(0.723)
Log(Debt stock [% trend GDP]) (t-1)	0.215***	0.203**	0.175*	-0.231***	-0.336***	-0.467***
	(0.079)	(0.083)	(0.104)	(0.083)	(0.102)	(0.156)
Constant	-1.951***	-1.867***	-1.996***	-0.549*	-0.090	0.645
	(0.254)	(0.219)	(0.383)	(0.308)	(0.361)	(0.673)
Number of observations	19,542	19,512	19,545	1,978	1,975	1,978
Number of pairs	867	866	867	95	95	95
Pseudo-R-squared	0.38	0.38	0.37	0.33	0.33	0.33
Log likelihood	-3933.23	-3923.83	-3938.48	-1127.54	-1126.41	-1123.59

Note: This table presents a set of PPML regressions where the dependent variable is bilateral disbursements as a percentage of the recipient's GDP trend. The cycles are computed as the percent deviation between GDP and trend GDP, where the trend is computed with the Hodrick-Prescott filter. The debt variable changes from one column to another, as is indicated in each column title. Regressions with all and advanced economy origins include pair and time fixed effects, while those with the origin of China include only pair effects. Clustered standard errors in parentheses. Clustered standard errors in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

6.2 Alternative Cycle Measures

In Table 6, we report variations of our baseline results using two alternative frequency domain methodologies to estimate the business cycles of recipient and origin countries. Columns (1)–(3) report results using the Christiano-Fitzgerald filter and columns (4)–(6) use the Baxter-King ideal band pass filter. The results closely resemble the baseline ones.

Table 6. Alternative Cycle Measures

	(1)	(2)	(3)	(4)	(5)	(6)
	Christiano-Fitzgerald			Baxter-King Filter		
	Origin: All	Origin: Adv.	Origin: China	Origin: All	Origin: Adv.	Origin: China
Recipient's cycle (t-1)	-0.266	-0.676	1.799	-0.688	-1.205	1.707
	(0.548)	(0.637)	(1.103)	(0.647)	(0.751)	(1.383)
Origin's cycle (t-1)	3.155***	5.168***	10.530***	3.280***	5.455***	12.172***
	(0.972)	(1.530)	(2.765)	(1.212)	(1.798)	(3.685)
Log(Pair total trade [% trend GDP])	0.501***	0.487***	0.435***	0.504***	0.480***	0.454***
	(0.050)	(0.086)	(0.083)	(0.051)	(0.088)	(0.085)
Log(Pair UN votes agreement score)	0.049	-0.088	0.200	0.040	-0.106	0.157
	(0.233)	(0.244)	(0.973)	(0.234)	(0.244)	(1.013)
Constant	-1.500***	-1.864***	-1.120***	-1.499***	-1.851***	-1.094***
	(0.099)	(0.127)	(0.183)	(0.100)	(0.129)	(0.189)
Number of observations	20,046	14,444	1,442	20,046	14,444	1,442
Number of pairs	1,239	785	88	1,239	785	88
Pseudo-R-squared	0.43	0.38	0.36	0.42	0.38	0.36
Log likelihood	-4178.68	-2624.47	-736.07	-4213.39	-2648.37	-742.65

Note: This table presents a set of PPML regressions where the dependent variable is bilateral disbursements as a percentage of the recipient's GDP trend. The cycles are computed as percent deviation between GDP and trend GDP, where the trend is computed with a Christiano-Fitzgerald or Baxter-King Filter as is indicated in each column title. Regressions with all and advanced economy origins include pair and time fixed effects, while those with the origin of China include only pair effects. Clustered standard errors in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

6.3 Time-invariant Country-pair Regressors

Finally, in Table 7, we report results removing the country-pair fixed effects included in previous specifications and replacing them with time-invariant country-pair regressors commonly used in the trade literature. We include three dummy variables capturing if each pair of countries share a language, if they share colonial origin, and if they have a common border. Additionally, we include a measure of geographical distance between each pair of countries. Column (1) reports results for

the complete set of origin countries, and columns (2) and (3) for advanced economies and China. The specifications in columns (1) and (2) include time fixed effects. We include country-pair fixed effects in our baseline specification since the interpretation of these controls in this case is not as straightforward as in the trade literature. What is worth noting is that the main results regarding the procyclicality of official bilateral lending with respect to the origin country's business cycle hold, but we now find some evidence of countercyclicality with respect to the receiving country's cycle when flows originate from advanced economies. While this result is interesting, we consider it with some skepticism, given that when controlling for country-pair fixed effects in a more stringent testing scenario, the result is not present.

Table 7. No Pair Fixed Effect and Time-invariant Controls

	(1)	(2)	(3)
	Origin: All	Origin: Adv.	Origin: China
Recipient's cycle (t-1)	-0.681	-1.312**	0.701
	(0.628)	(0.619)	(1.488)
Origin's cycle (t-1)	2.512***	3.788***	13.747***
	(0.927)	(1.417)	(3.136)
Log(Pair total trade (%Trend GDP))	0.719***	0.722***	0.476***
	(0.061)	(0.043)	(0.079)
Log(Pair UN votes agreement score)	1.077***	0.900***	-1.337
	(0.147)	(0.189)	(0.974)
Common language	-0.088	0.208	-3.532***
	(0.151)	(0.160)	(0.223)
Colonial dummy	0.018	-0.034	-1.315***
	(0.137)	(0.169)	(0.416)
Geographic distance	0.000***	0.000***	-0.000
	(0.000)	(0.000)	(0.000)
Border countries dummy	0.329	-1.424***	0.289
	(0.330)	(0.160)	(0.399)
Constant	-2.419***	-2.530***	-1.567***
	(0.114)	(0.125)	(0.366)
Number of observations	27,626	22,337	1,986
Number of groups (pairs)	1,378	1,205	98
pseudo-R-squared	0.20	0.22	0.12
Log likelihood	-8868.73	-5078.34	-1483.07

Note: This table presents a set of PPML regressions where the dependent variable is bilateral disbursements as a percentage of the recipient's GDP trend. The cycles are computed as a percent deviation between GDP and trend GDP, where the trend is computed with the Hodrick-Prescott filter. Only the regressions with all and advanced origins include time fixed effects. Clustered standard errors in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

7. Discussion and Conclusions

Bilateral loans are a significant source of official debt. Official bilateral lending was basically the only source of official development assistance until the creation of multilateral lending institutions and the IMF in the 1940s. A key feature of official lending is that it can serve as a mechanism to insure against private capital flow swings that are highly procyclical by responding countercyclically, that is, by increasing in bad times and retrenching in good ones. Empirical evidence has shown that this is a key characteristic of multilateral development lending. However, to our knowledge, there had been no assessment of this characteristic in official bilateral flows, which nevertheless represent an important share of the total public external debt of emerging and developing countries. This paper explores this question, and finds that, on the contrary, bilateral lending varies alongside the business cycle of the lending country.

We find that the origin country's position in the business cycle matters—and more so than the receiving country's place in the cycle. This result holds true both when the flow originates in an advanced economy and when it originates in China, the largest provider of bilateral lending, when measured as a share of the GDP of the average receiving country. Thus, receiving countries may be "importing" economic volatility from lending countries. The policy implication is that countries that rely on bilateral debt should diversify their pool of lenders to mitigate this volatility and still reap the benefits of official debt flows.

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## Appendix A. List of Recipient Countries, by Income Level

Low Income			
Benin	Eritrea	Madagascar	Senegal
Burkina Faso	Ethiopia	Malawi	Sierra Leone
Burundi	Gambia, The	Mali	Tanzania
Central African Republic	Guinea	Mozambique	Togo
Chad	Guinea-Bissau	Nepal	Uganda
Comoros	Haiti	Niger	Zimbabwe
Congo, Dem. Rep.	Liberia	Rwanda	

Middle Income			
Albania	Dominica	Lebanon	Russian Federation
Algeria	Dominican Republic	Lesotho	Samoa
Argentina	Ecuador	Maldives	Sao Tome and Principe
Armenia	Egypt, Arab Rep.	Mauritania	Solomon Islands
Azerbaijan	El Salvador	Mauritius	South Africa
Bangladesh	Eswatini	Mexico	Sri Lanka
Belize	Fiji	Moldova	St. Lucia
Bhutan	Gabon	Mongolia	St. Vincent and the Grenadines
Bolivia	Ghana	Montenegro	Sudan
Bosnia and Herzegovina	Grenada	Morocco	Tajikistan
Botswana	Guatemala	Myanmar	Thailand
Brazil	Guyana	Nicaragua	Timor-Leste
Bulgaria	Honduras	Nigeria	Tonga
Cabo Verde	India	North Macedonia	Tunisia
Cambodia	Indonesia	Pakistan	Turkey
Cameroon	Jamaica	Panama	Uzbekistan
China	Jordan	Papua New Guinea	Vanuatu
Colombia	Kazakhstan	Paraguay	Venezuela, RB
Congo, Rep.	Kenya	Peru	Vietnam
Costa Rica	Kyrgyz Republic	Philippines	Yemen, Rep.
Cote d'Ivoire	Lao PDR	Romania	Zambia

Appendix B. List of Lending Countries, by Category

Country Name	Category	Country Name	Category	Country Name	Category
Australia	Advanced	China	China	Libya	Other
Austria	Advanced	Algeria	Other	Malaysia	Other
Belgium	Advanced	Angola	Other	Mauritius	Other
Canada	Advanced	Argentina	Other	Mexico	Other
Czech Republic	Advanced	Barbados	Other	Morocco	Other
Denmark	Advanced	Belarus	Other	Nigeria	Other
Finland	Advanced	Bosnia-Herzegovina	Other	Oman	Other
France	Advanced	Brazil	Other	Pakistan	Other
Germany	Advanced	Brunei	Other	Panama	Other
Greece	Advanced	Bulgaria	Other	Peru	Other
Ireland	Advanced	Burundi	Other	Poland	Other
Israel	Advanced	Colombia	Other	Qatar	Other
Italy	Advanced	Congo, Rep.	Other	Romania	Other
Japan	Advanced	Costa Rica	Other	Russian Federation	Other
Korea, Republic of	Advanced	Cote d'Ivoire	Other	Saudi Arabia	Other
Netherlands	Advanced	Cuba	Other	South Africa	Other
New Zealand	Advanced	Egypt	Other	Tanzania	Other
Norway	Advanced	Gambia, The	Other	Thailand	Other
Portugal	Advanced	Guatemala	Other	Togo	Other
Singapore	Advanced	Hungary	Other	Trinidad and Tobago	Other
Slovak Republic	Advanced	India	Other	Tunisia	Other
Spain	Advanced	Indonesia	Other	Turkey	Other
Sweden	Advanced	Iran, Islamic Republic	Other	United Arab Emirates	Other
Switzerland	Advanced	Iraq	Other	Uzbekistan	Other
United Kingdom	Advanced	Kuwait	Other	Venezuela	Other
United States	Advanced	Kyrgyz Republic	Other	Vietnam	Other

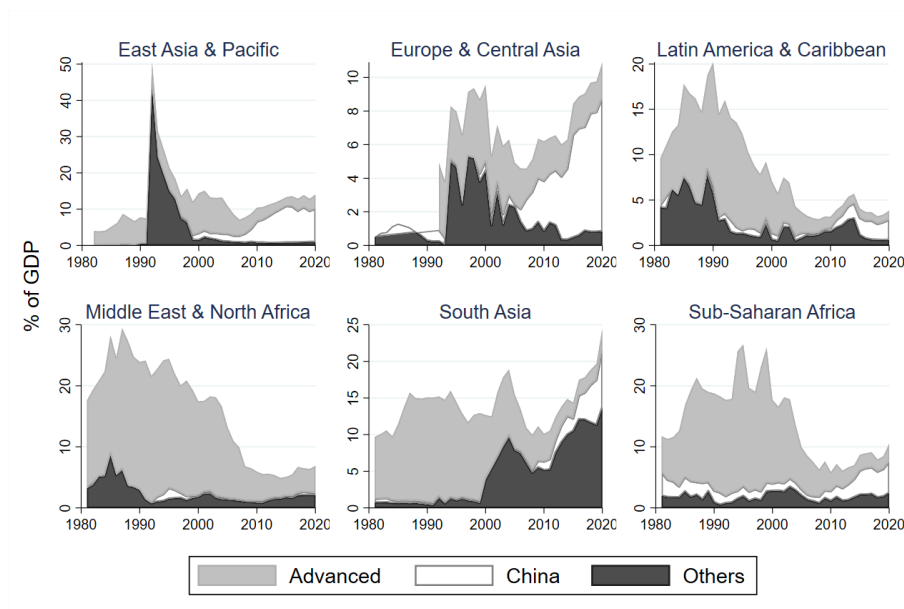# Appendix C. Additional Figures

Figure C.1 Disaggregation of Total Public External Debt by Geographical Region (Average Country)
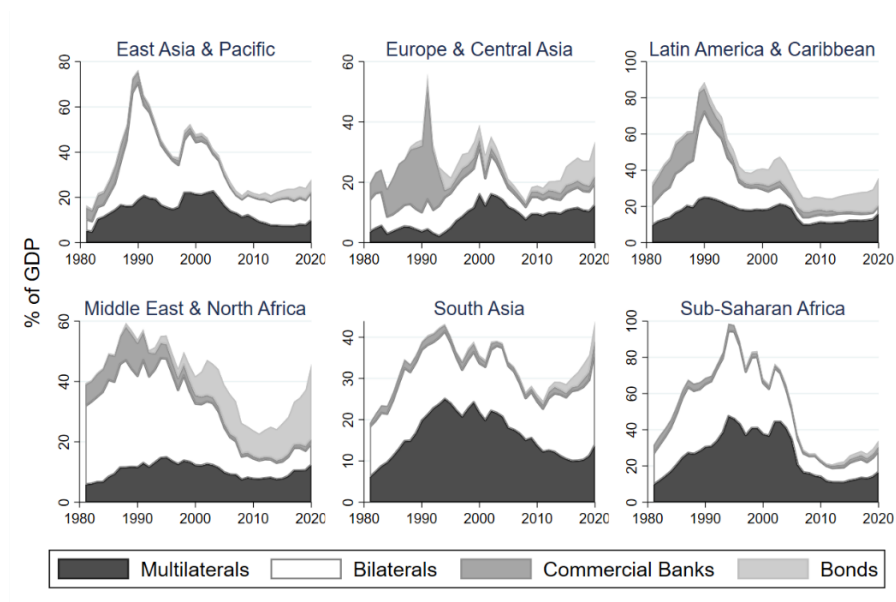
Source: Authors' compilation based on the IDS of the World Bank.

Figure C.2 Disaggregation of Total Bilateral Public Debt by Origin and Geographical Region (Average Country)

Source: Authors' compilation elaboration based on the IDS of the World Bank.

Appendix D. Additional Results

Table D.1 Results by Recipient Income Level

	(1)	(2)	(3)	(4)	(5)	(6)
	Origin: All	Origin: All	Origin: Advanced	Origin: Advanced	Origin: China	Origin: China
	Recipient: Low Income	Recipient: Middle Income	Recipient: Low Income	Recipient: Low Income	Recipient: Middle Income	Recipient: Low Income
Recipient's cycle (t-1)	0.403	-0.198	1.193	-1.032	2.579**	0.751
	(0.896)	(0.611)	(1.219)	(0.662)	(1.310)	(1.383)
Origin's cycle (t-1)	2.023	2.422**	8.713***	3.229*	10.240	13.386***
	(2.142)	(1.086)	(3.346)	(1.872)	(7.245)	(3.399)
Log(Pair total trade [% trend GDP])	0.470***	0.509***	0.489***	0.323***	0.457***	0.467***
	(0.073)	(0.081)	(0.133)	(0.084)	(0.125)	(0.100)
Log(Pair UN votes agreement score)	-1.158**	0.597**	0.228	0.601**	-1.865	0.075
	(0.567)	(0.242)	(0.508)	(0.262)	(1.160)	(0.847)
Constant	-1.750***	-1.298***	-1.394***	-1.278***	-1.449***	-1.052***
	(0.193)	(0.145)	(0.280)	(0.151)	(0.235)	(0.235)
Number of observations	5,013	22,837	3,129	16,425	517	1,462
Number of pairs	324	1072	179	688	26	69
Pseudo-R-squared	0.33	0.43	0.38	0.38	0.19	0.37
Log likelihood	-1366.74	-5157.78	-747.96	-3164.93	-324.70	-809.91

Note: This table presents a set of PPML regressions where the dependent variable is bilateral disbursements as a percentage of the recipient's GDP trend. The cycles are computed as percent deviation between GDP and trend GDP, where the trend is computed with the Hodrick-Prescott filter. The recipient's income group is according to the World Bank classification. Regressions with all and advanced economy origins include pair and time fixed effects, while those with the origin of China include only pair effects. Clustered standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table D.2 Results by Region

	(1)	(2)	(3)	(4)	(5)	(6)
	EAP	ECA	LAC	MENA	SA	SSA
Recipient's cycle (t-1)	-10.108	3.143**	0.580	0.623	9.263*	-3.634**
	(7.014)	(1.505)	(1.985)	(2.967)	(5.120)	(1.726)
Origin's cycle (t-1)	4.274**	3.410	6.031**	3.232	-6.957*	-1.011
	(1.795)	(4.343)	(2.984)	(2.149)	(3.648)	(1.419)
Log(Pair total trade [% trend GDP])	0.481***	0.595***	0.367**	0.470***	0.509***	0.507***
	(0.117)	(0.149)	(0.186)	(0.134)	(0.168)	(0.054)
Log(Pair UN votes agreement score)	0.278	5.123***	0.301	2.045***	-0.618	-0.279
	(0.622)	(1.310)	(0.357)	(0.499)	(0.606)	(0.328)
Recipient's cycle (t-1)* Adv dummy	10.421	-1.794	-2.122	-3.375	-8.475	4.363**
	(7.039)	(2.055)	(2.418)	(2.948)	(5.686)	(1.948)
Origin's cycle (t-1)* Adv dummy	2.162	-5.648	-5.000	7.109	5.703	6.902**
	(3.675)	(6.491)	(3.453)	(5.309)	(5.742)	(2.853)
Recipient's cycle (t-1)* China dummy	7.186	5.348	-0.606	-4.158	-1.353	5.594***
	(7.728)	(4.016)	(4.867)	(6.059)	(6.221)	(1.925)
Origin's cycle (t-1)* China dummy	10.529	6.670	-0.202	-2.217	14.757***	3.418
	(8.539)	(12.202)	(7.050)	(7.382)	(5.642)	(4.282)
Constant	-1.278***	-0.474*	-1.374***	-0.756***	-1.028**	-1.598***
	(0.295)	(0.287)	(0.293)	(0.279)	(0.444)	(0.125)
Sum recipient's cycle adv.	0.313	1.348	-1.542	-2.752	0.788	0.730
	(1.280)	(1.384)	(1.097)	(1.700)	(3.330)	(0.910)
Sum origin's cycle adv.	6.436*	-2.238	1.031	10.341**	-1.254	5.891**
	(3.359)	(5.434)	(2.876)	(4.886)	(4.692)	(2.476)
Sum recipient's cycle China	-2.922	8.491**	-0.026	-3.535	7.910**	1.960**
	(4.066)	(3.677)	(4.427)	(5.431)	(3.160)	(0.898)
Sum origin's cycle China	14.803*	10.080	5.829	1.015	7.800*	2.407
	(8.453)	(10.120)	(5.751)	(7.077)	(4.385)	(4.137)
Number of observations	3,799	2,956	6,552	3,169	2,723	8,651
Number of pairs	174	187	293	124	116	502
Pseudo-R-squared	0.51	0.51	0.37	0.33	0.64	0.35
Log likelihood	-808.81	-525.63	-1404.00	-651.27	-526.54	-2418.49

Note: This table presents a set of PPML regressions where the dependent variable is bilateral disbursements as a percentage of the GDP trend. The cycles are computed as the percent deviation between GDP and trend GDP, where the trend is computed with the Hodrick-Prescott filter. The "Sum" rows refer to the joint coefficients of each cycle plus its corresponding interaction with the advanced or Chinese origin dummy. The recipient's geographical group is according to the World Bank's classification: East Asia and the Pacific (EAP), Europe and Central Asia (ECA), Latin America and the Caribbean (LAC), Middle East and North Africa (MENA), South Asia (SA) and Sub-Saharan Africa (SSA). All regressions include pair and time fixed effects. Clustered standard errors in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.